

MEPNN Supplier Scouting Opportunity Synopsis

Section 1: General Information

Scouting Number	2024-250
Item to be Scouted	Hydrofluoric Acid and Perchloric Acid Exhaust Fans
Days to be scouted	30
Response Due By	09/20/2024
Description	<p>For the construction of the new Energy and Minerals Research Facility (EMRF) for the U. S. Geological Survey (USGS) at the Colorado School of Mines (Mines), 1000 18th Street, Golden, Colorado 80401, provide packaged Hydrofluoric Acid Lab Exhaust Fans (HEF) AND Perchloric Acid Lab Exhaust Fans (PEF) delivered to the EMRF construction site.</p> <p>This project is federally funded by President Joe Biden's Bipartisan Infrastructure Law (BIL). Therefore, the material used for construction is required to be compliant with the Build America, Buy America Act (BABAA). This NIST MEP Supplier Report seeks HEF and PEF Lab Exhaust Fans that meets or exceeds the basis of design. The basis of design are Plasticair (Skyplume) HEF and PEF Lab Exhaust Fans described herein (including additional information). The basis of design HEF and PEF Lab Exhaust Fans meets or exceeds the design requirements including the strict technical requirements, maximum size requirements, maximum delivery schedule, and the maximum cost parameters enclosed. See also the requirements stated in the enclosed specifications, drawings, dimension and performance requirements, and other documents including warranty requirements. Provide the spare parts outlined in the specifications.</p> <p>Packaged HEF Lab Exhaust Fans and associated components and accessories include, but are not limited to, the following: 1. Special Chemical Resistant Requirements 2. Fans 3. Fan Housing 4. Fan Impellers 5. Fan Motors 6. Fan Inlet Plenum.</p> <p>Packaged PEF Lab Exhaust Fans and associated components and accessories include, but are not limited to, the following: 1. Special Chemical Resistant and Air Performance Requirements 2. By-pass Venturi Exhaust System 3. Fan Housing 4. Venturi Duct System 5. Blower Fan 6. Impeller 7. Special Bearings 8. Special Belt and Direct Drive System 9. Guards 10. Motor 11. Shaft 12. Steel Fan Base 13. Flushing and Wash Rings 14. Wash System with Control Panel 15. Testing and Balancing Services.</p>
Notify Requester Immediately	
State item to be used in	Colorado

Section 2: Technical Information

Type of supplier being sought	Manufacturer
Reason	BABA
Describe the manufacturing processes (elaborate to provide as much detail as possible)	Electronic and mechanical assembly.
Provide dimensions / size / tolerances / performance specifications for the item	See information provided.
List required materials needed to make the product, including materials of product components	Various, see information provided.

Are there applicable certification requirements?	Yes
Certification(s) required	UL
Details	AMCA, NEMA, NRTL, NFPA
Are there applicable regulations?	No
Are there any other standards, requirements, etc.?	Yes
Details	See other requirements provided in the enclosed documents.
NAICS 1	333413 Industrial and Commercial Fan and Blower and Air Purification Equipment Manufacturing
NAICS 2	
Additional Technical Comments	See enclosed specifications and HEF and PEF information.

Section 4: Business Information

Estimated potential business volume	Limited to one set of equipment.
Estimated target price / unit cost information (if unavailable explain)	Maximum total costs shall be \$1,500,000 total for 22 HEF and 6 PEF including material and assembly, shipping, start up services including commissioning and coordinating with Building Automation System, and required minimum manufacturer's warranty (see specifications). Costs also include providing approved submittal paperwork required in the specifications.
When is it needed by?	Delivery schedule shall be no later than 3:00 PM (local time) July 31, 2025 for the manufacturer, packaging, and transportation of the HEF and PEF. If the scheduled delivery of the fans are on any date prior to listed above, this placement date will need to be coordinated with the general contractor. No storage fees will be allowed for the time between the manufacturing date and the delivery date. Submittal approval due date shall be no later than 3:00 PM (local time), December 20, 2024.
Describe packaging requirements	Crate and package HEF and PEF for secure and undamaged transportation and delivery.
Where will this item be shipped?	Shipping will be to Golden, Colorado 80401, at the construction site address listed above.

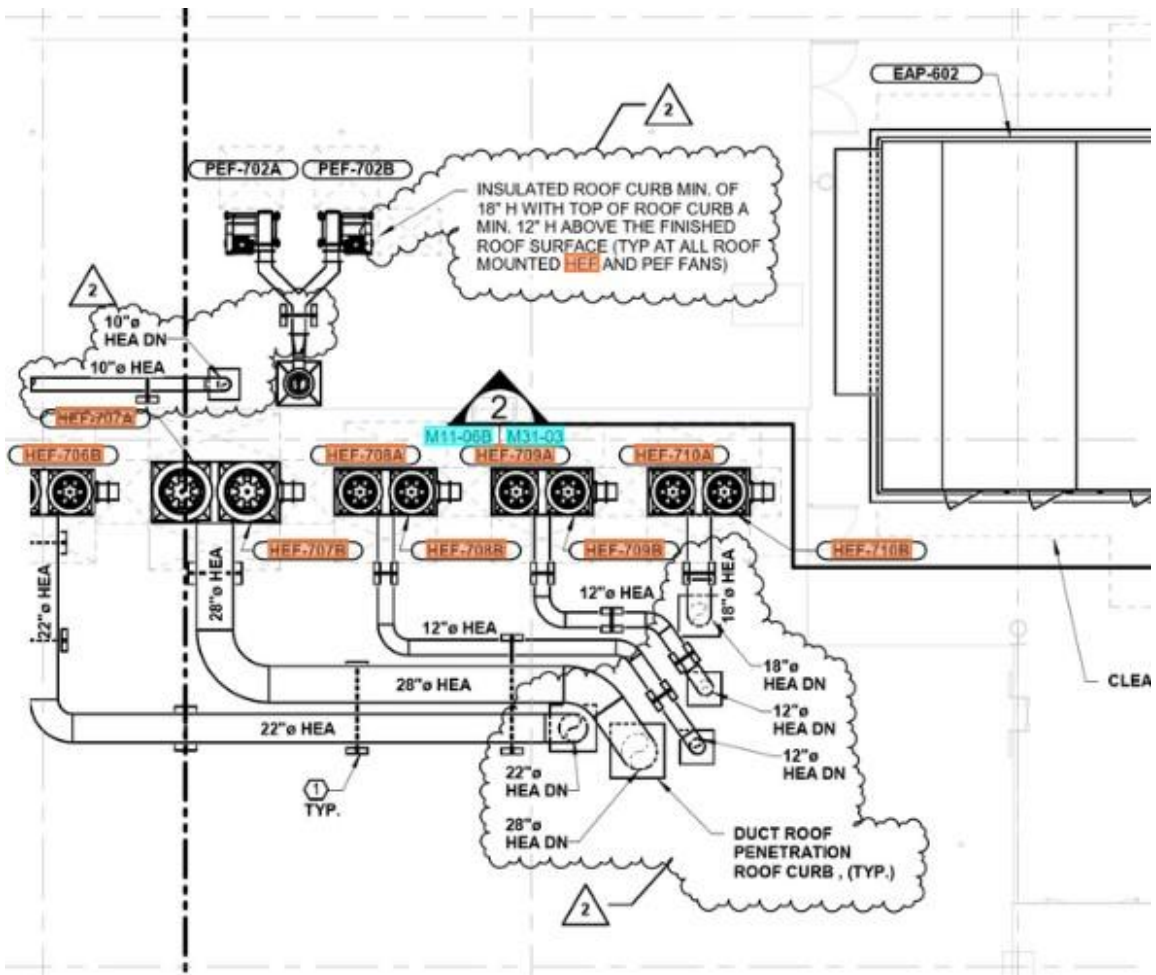
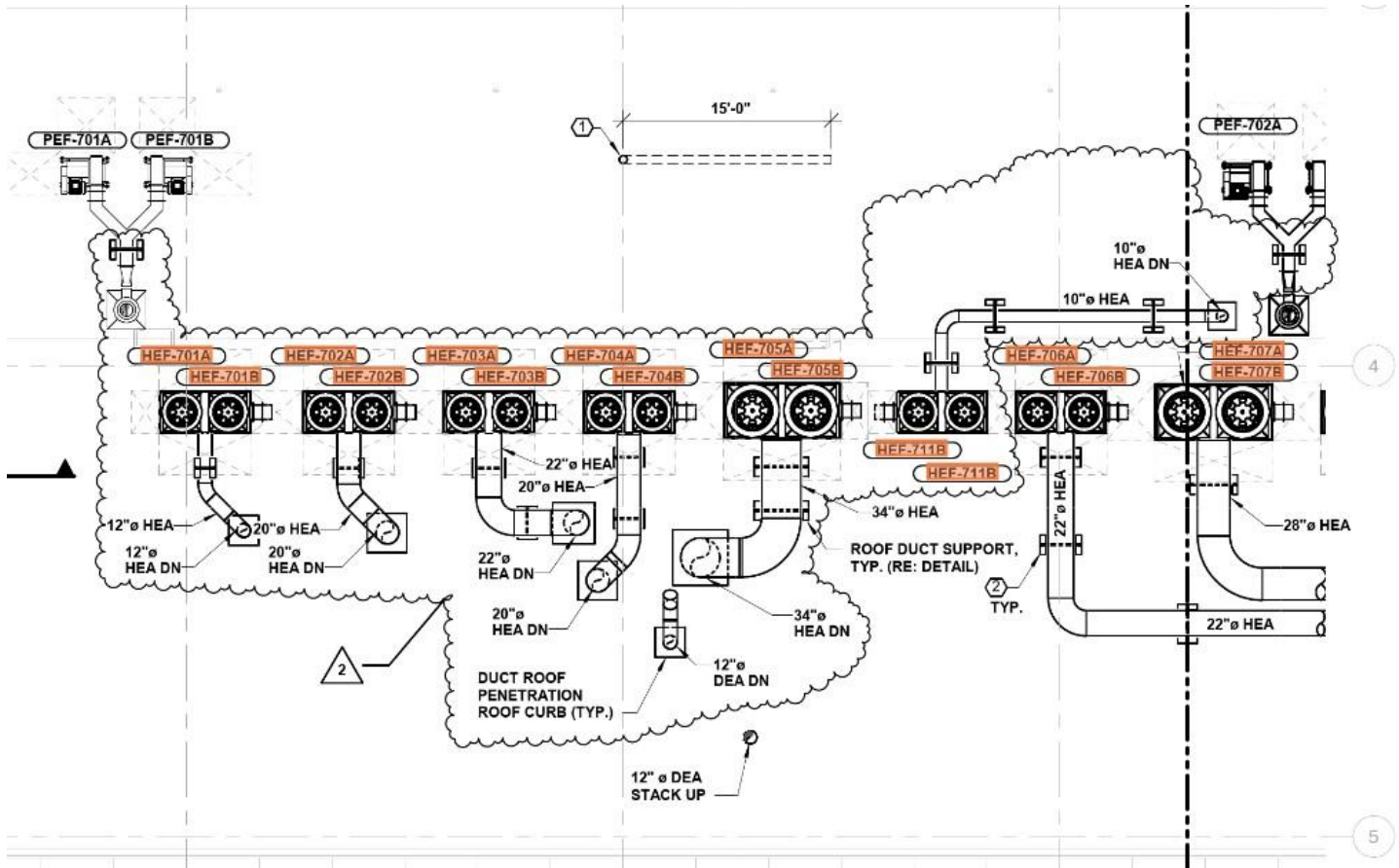
Additional Comments

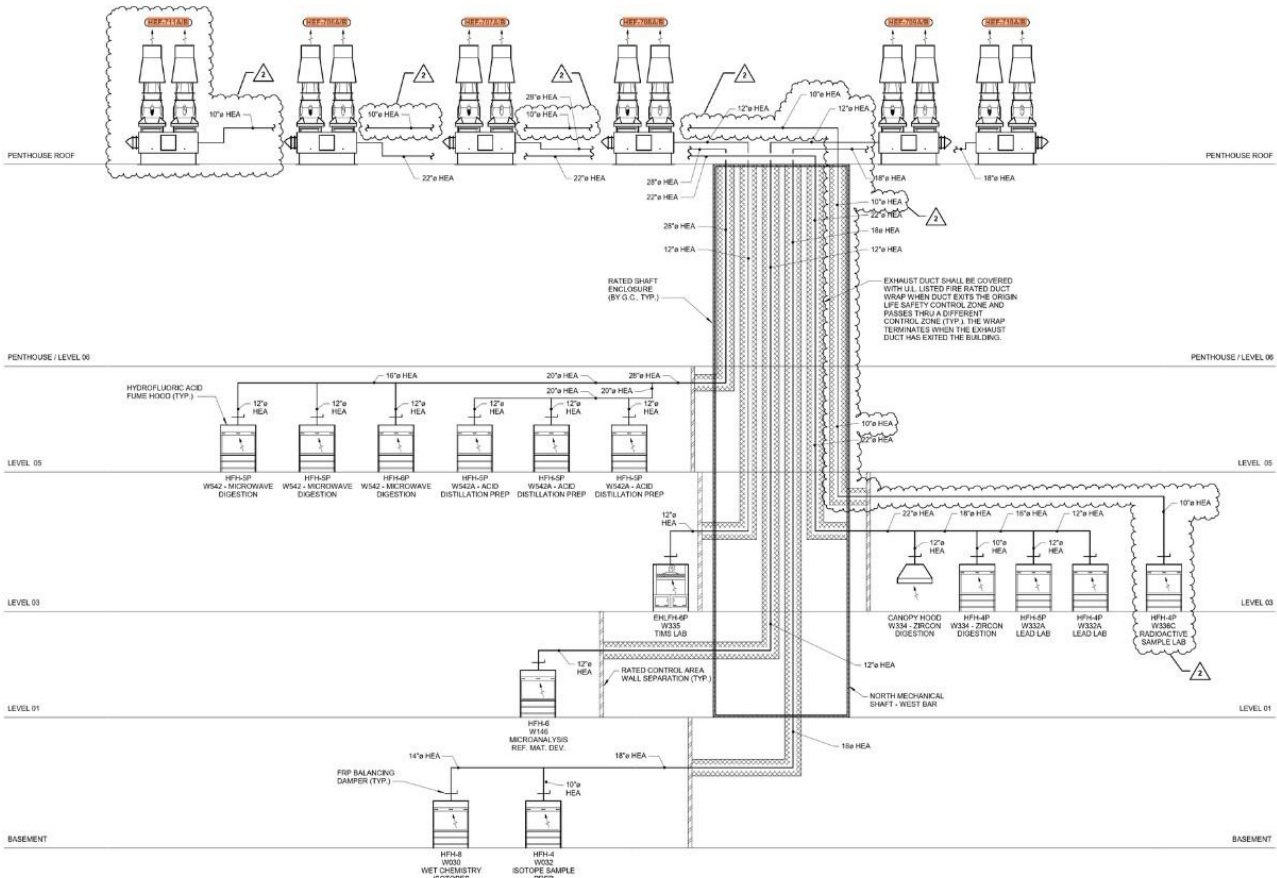
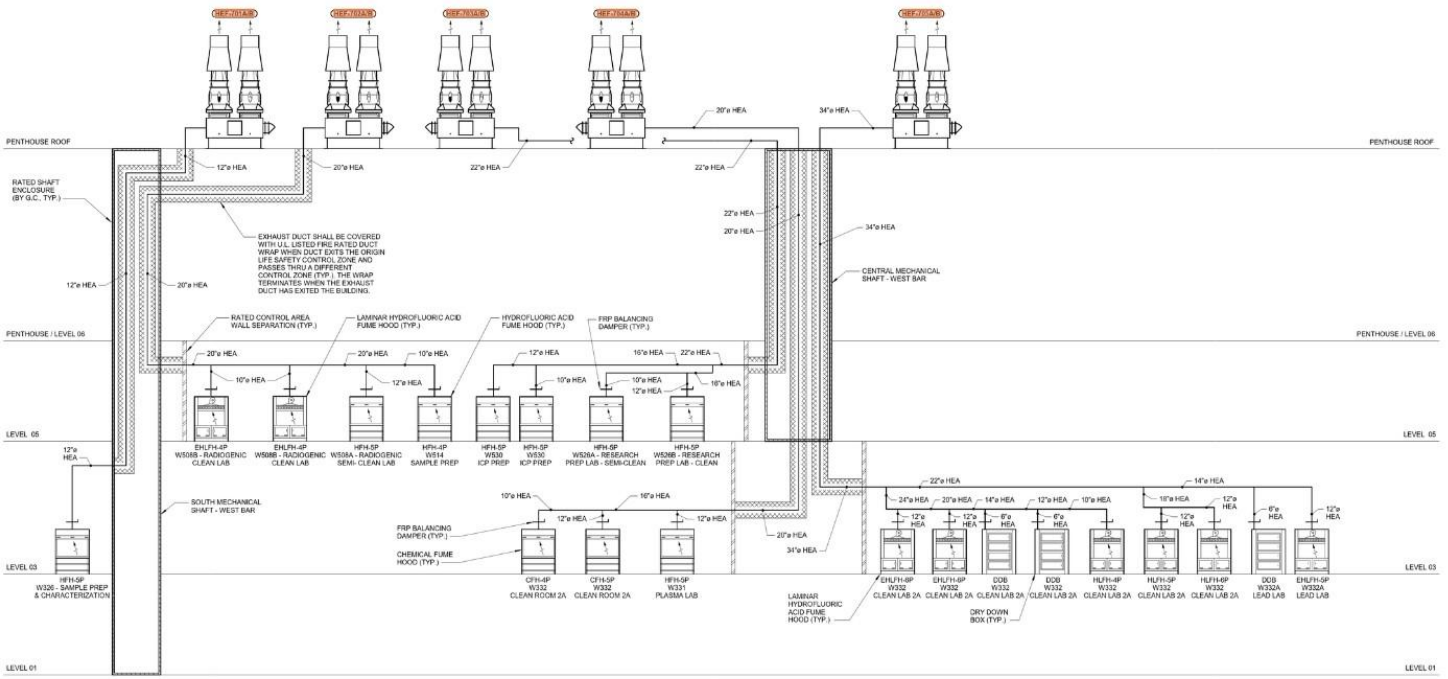
Is there other information you would like to include?	
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EMRF Hydrofluoric and Perchloric Exhaust Fans NIST MEP Submittal

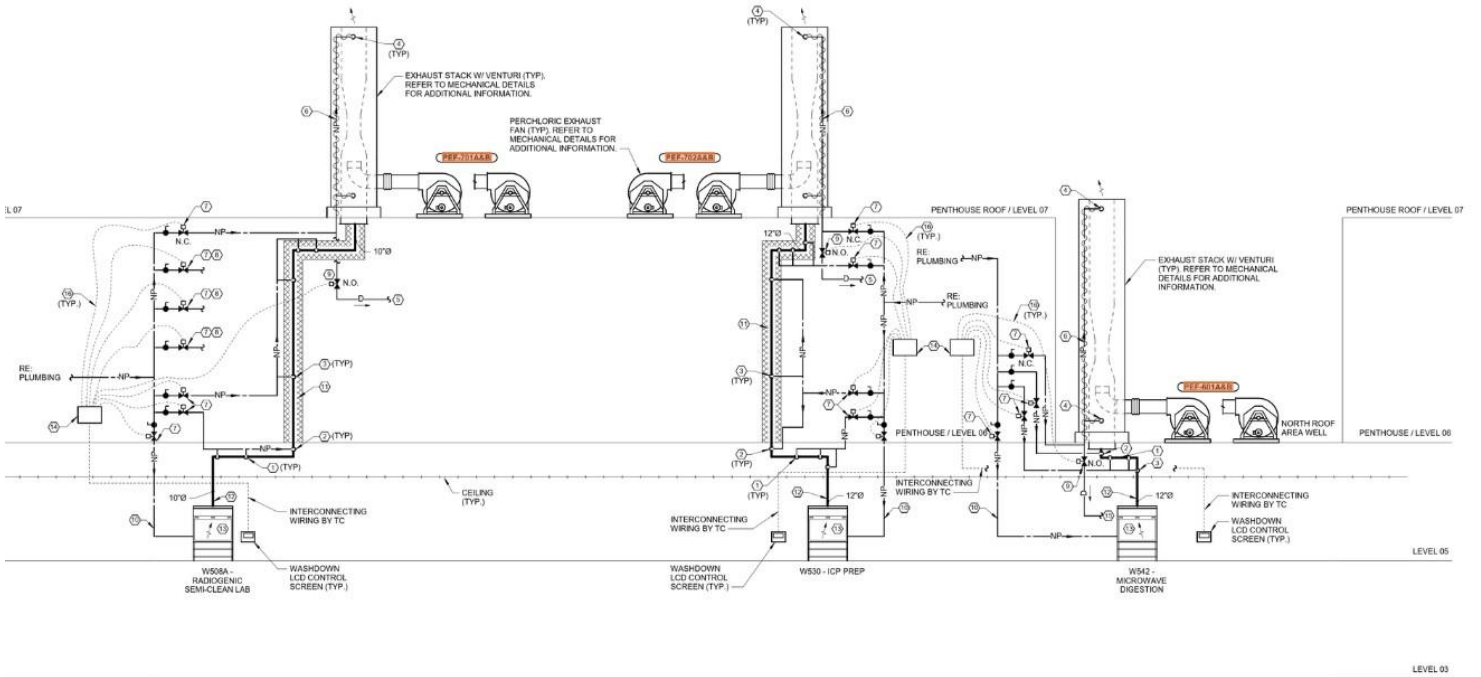
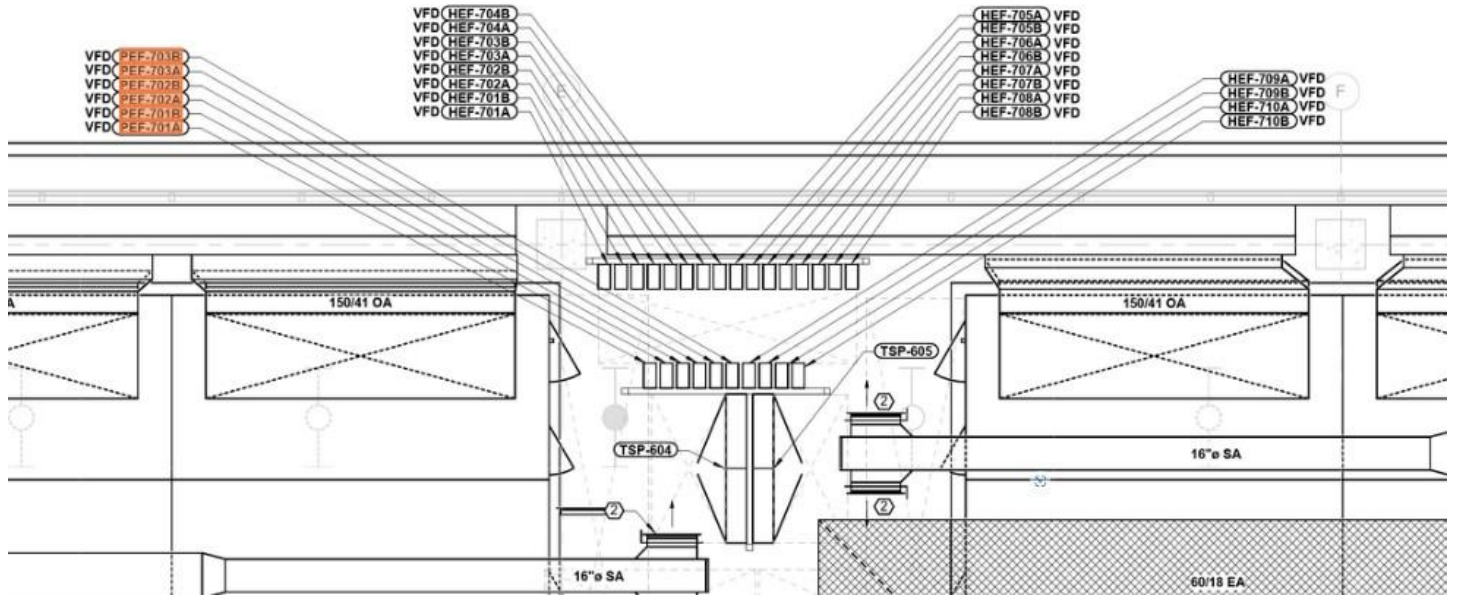
Product: Plasticair Hydrofluoric and Perchloric Exhaust Fans

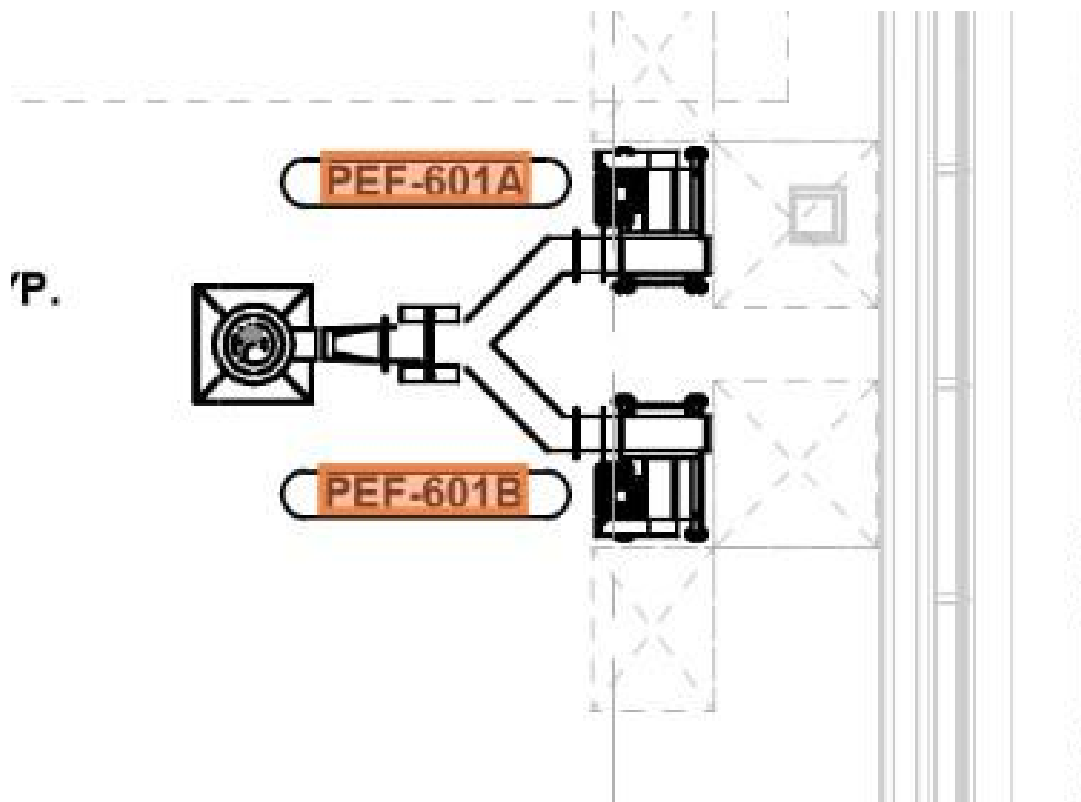
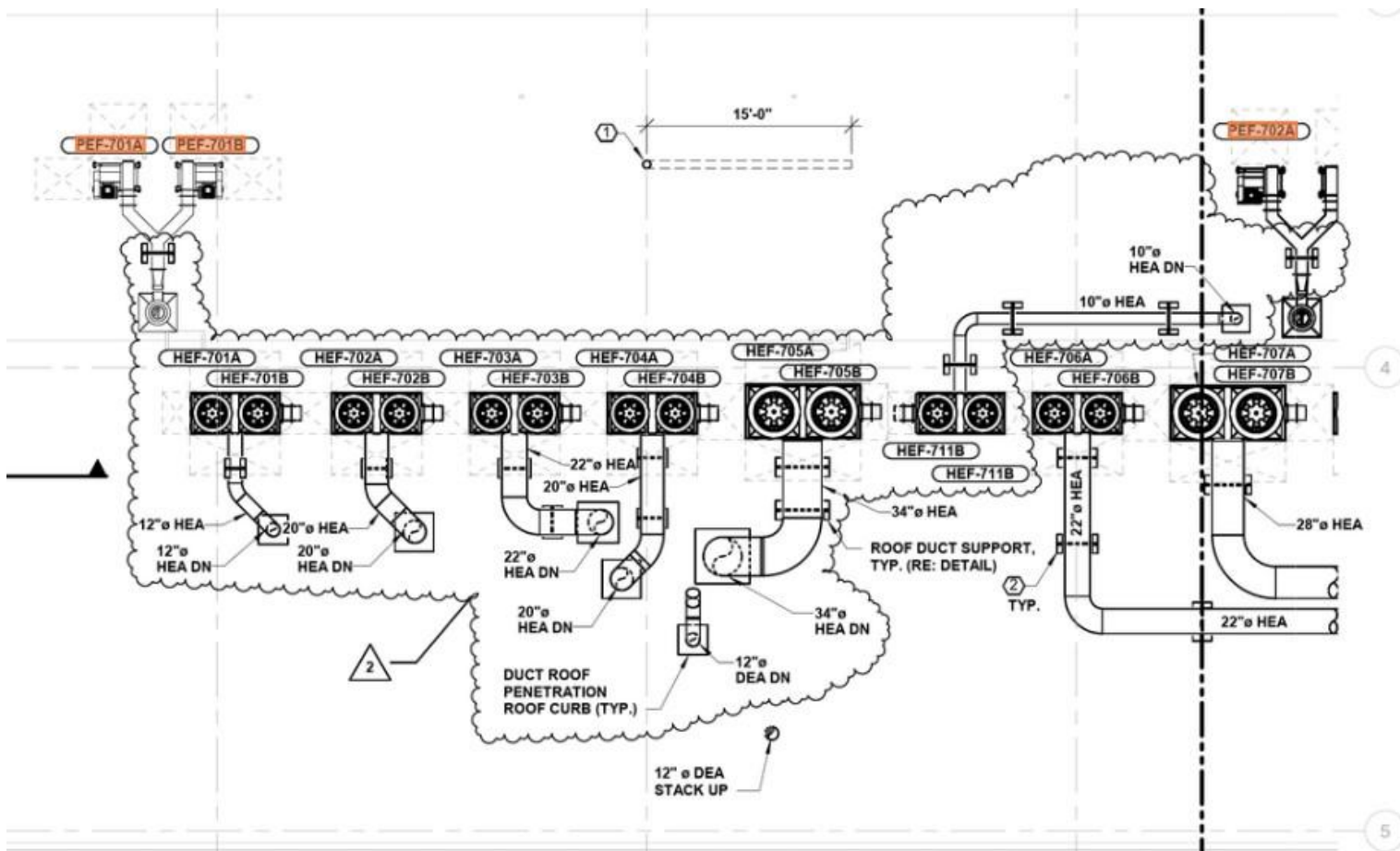
Hydrofluoric Fans in the Drawings





Perchloric Fans in the Drawings







Plasticair

FAN COMPANY



GIF SERIES (BACKWARD INCLINED)



600 SERIES (PROPELLER)



BCMPA SERIES (BACKWARD CURVED)



700 SERIES (PROPELLER)



MINI SERIES (RADIAL & OPTION FOR BACKWARD INCLINED)



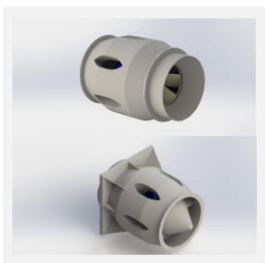
800 SERIES (BACKWARD INCLINED)



HPB SERIES (RADIAL BLADE)



900 SERIES (PROPELLER)



DMF SERIES (MIXED FLOW)





Fan Model: DMF 150

Project: 2-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-702A/B

FAN PERFORMANCE DATA		
Wheel Ø: 18.25 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 2970 CFM	Fan Power: 1.82 BHP	Altitude: 5800 ft
Fan Speed: 2886 RPM	Actual Density: 0.0606 lb/ft ³	Outlet Pressure: 0 in. W.G
Tip Speed: 13789 ft/min	Temperature: 70 °F	Fan E.S.P.: 2.54 in. W.G
Efficiency (Mechanical): 67 %	Efficiency (Static): 65 %	

SOUND DATA								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	77	80	84	87	90	86	78	71
Sound Pressure Levels 10 ft (A-weighted)	31	44	55	63	69	67	58	49
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	72							



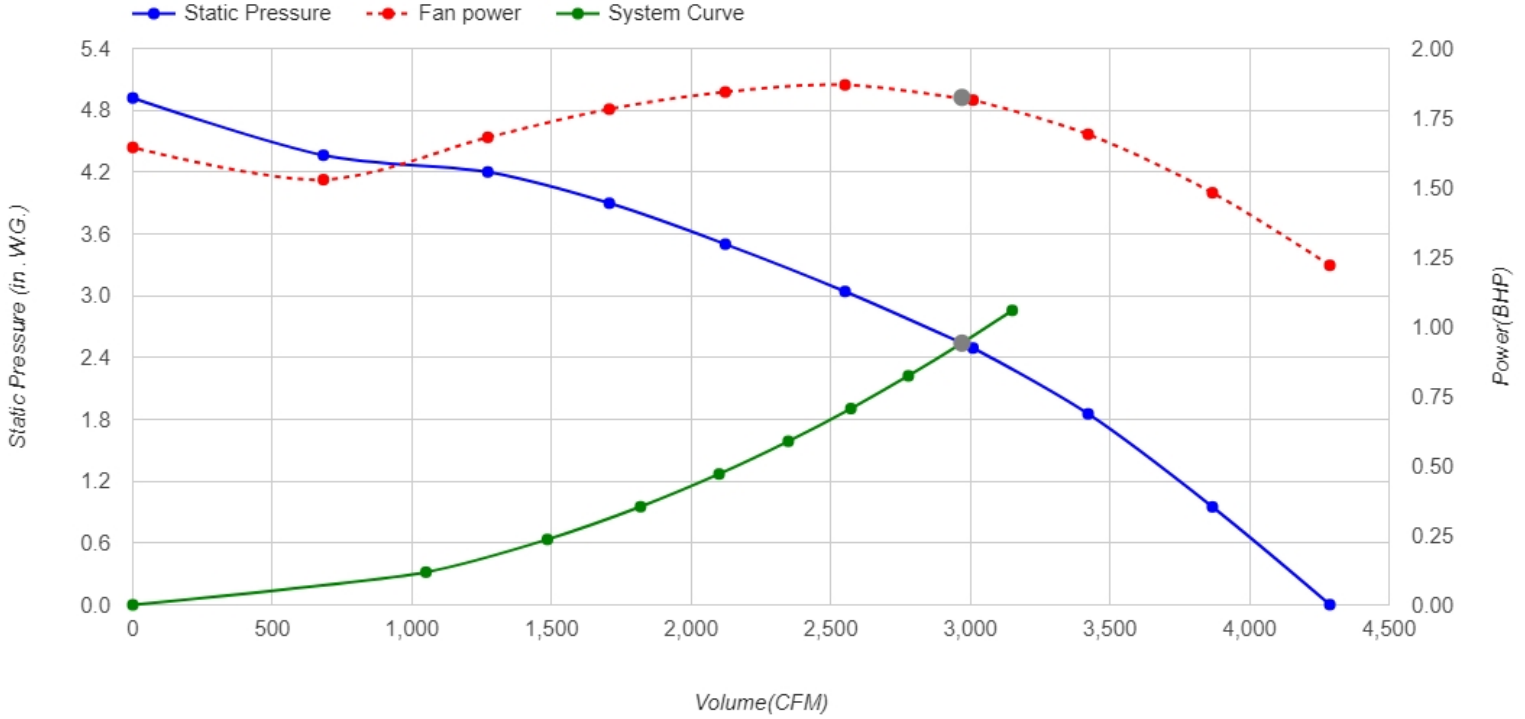
Customer:	0	Fan Tag:	HEF-702A/B
Rep:	CFM Company	Quote :	31182
Job ID:	CSM - EMRF - BLDG	Catalogoued	October 2013

Silencer Insertion loss		Project Sound Performance							
Acoustic Windband insertion loss		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Select Silencer Size (Inch)									
Silencer Pressure Drop	in.w.g								
Inlet Sound Power Levels (dBA)		76	79	82	85	88	85	77	70
Outlet Sound Power Levels (dBA)		77	80	84	87	90	86	78	71
Inlet Sound Power levels are not AMCA Certified									



Fan Model: DMF 150

Project: 2-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-702A/B



FEI: 1.33

CFM:2970	RPM: 2886	Static Pressure: 2.54 in. W.G	BHP: 1.82
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Sound Data								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	77	80	84	87	90	86	78	71
Sound Pressure Levels 10 ft (A-weighted)	31	44	55	63	69	67	58	49
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	72							

Surrounding Conditions	
Temperature (°F)	70
Altitude (ft.)	5800
Actual Density (lb/ft³)	0.0606
Actual Density (lb/ft³)	0.0606

Other Performance Data	
Tip Speed (ft/min)	13789
Fan Class	Class II
Efficiency (Mech)	67 %
Efficiency (Static)	65 %
Airstream Tem Change	1.79 °F
Wheel Width (%)	100
Outlet Velocity (ft/min)	1320



Plasticair Inc. certifies that the DMF Mixed Flow Fans shown herein are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 210, publication 300, energy efficiency classification 205 and comply with the requirements of the AMCA certified ratings program.

dBa Data is not AMCA International Licensed
 dBA levels are not licensed by AMCA International
 Performance ratings do not include the effects of cross winds.
 Power Ratings (watts, kW, or bhp) does not include transmission losses.
 Performance ratings do not include the effects of appurtenances (accessories)
 The Sound Pressure Levels are based on a fan installation next to (No reflective surface)
 The sound Power level ratings shown are in decibels referred to 10-12 watts, calculated per AMCA International Standard 301
 Values shown are for (Outlet Lwo or Outlet LwoA) Sound Power Levels for: Installation Type C: Ducted Inlet, Free Outlet.
 The Environment for the fan installation effects the measure sound values, therefore the dBA levels cannot be guaranteed. A fans dBA is influenced by nearby sound reflecting surfaces. A-weighted Octave Band Sound Pressure levels (dBA) are not licensed by AMCA Intarnation. Please Consult AMCA publication 303 for more information.

ALP-DMF150- STACK PERFORMANCE DATA

Inlet Volume	2970	CFM
Induced Volume	1188	CFM
Windband Volume	4158	CFM
Dilution Ratio	140	%
Nozzle Velocity	4500	FPM
Windband Velocity	1366	FPM
Stack Pressure Drop	1.14	in.wg.
Effective Plume Rise at Inlet Volume - (Not Including Equipment)		
Plume Height (10 MPH)	14.06	ft
Plume Height (15 MPH)	9.38	ft
Plume Height (20 MPH)	7.03	ft
Effective Stack Height - Includes Equipment Height		
Crosswind	Effective Stack Height	
10 MPH	21.86	ft
15 MPH	17.17	ft
20 MPH	14.83	ft

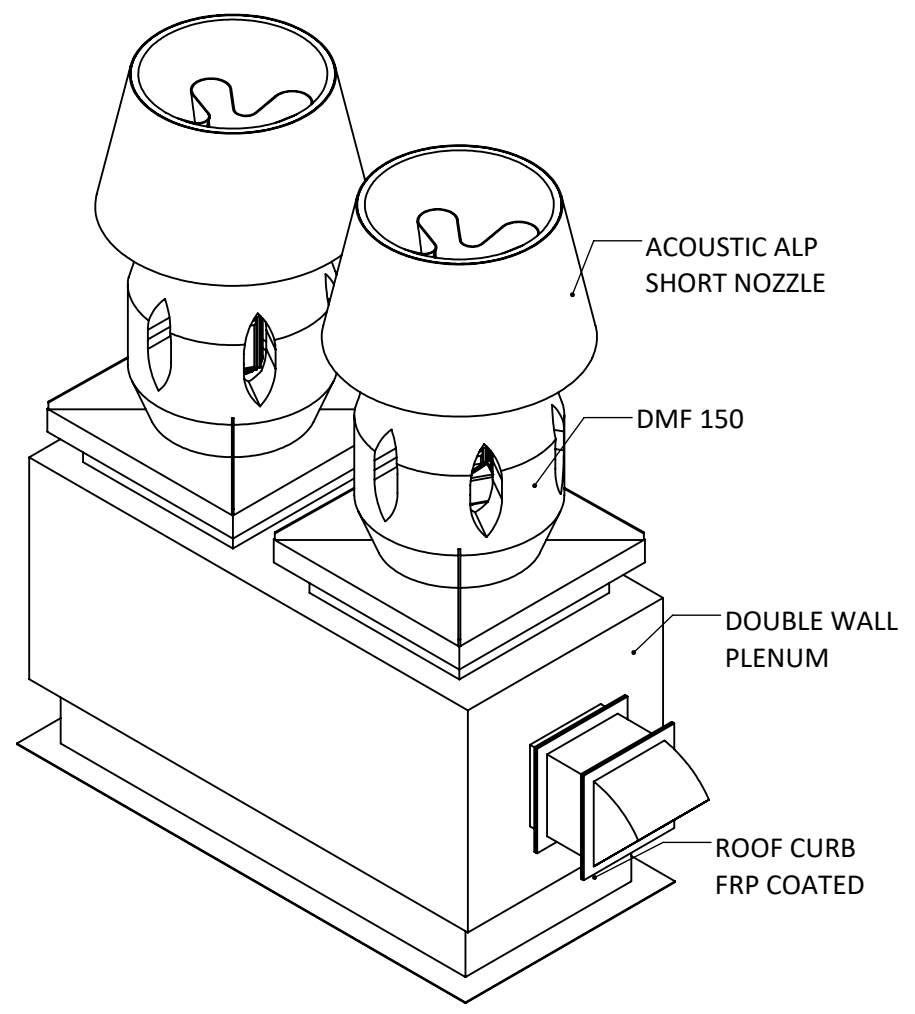
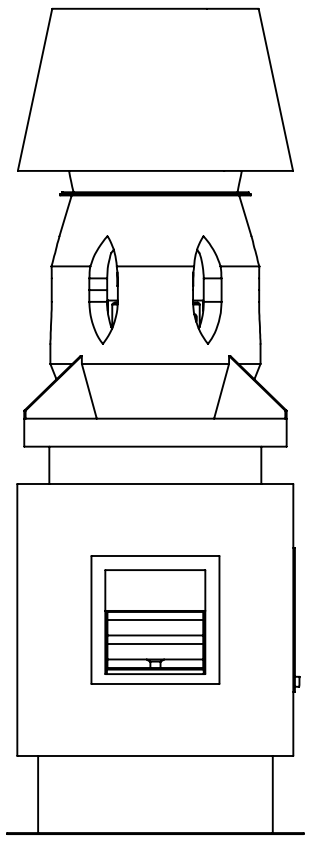
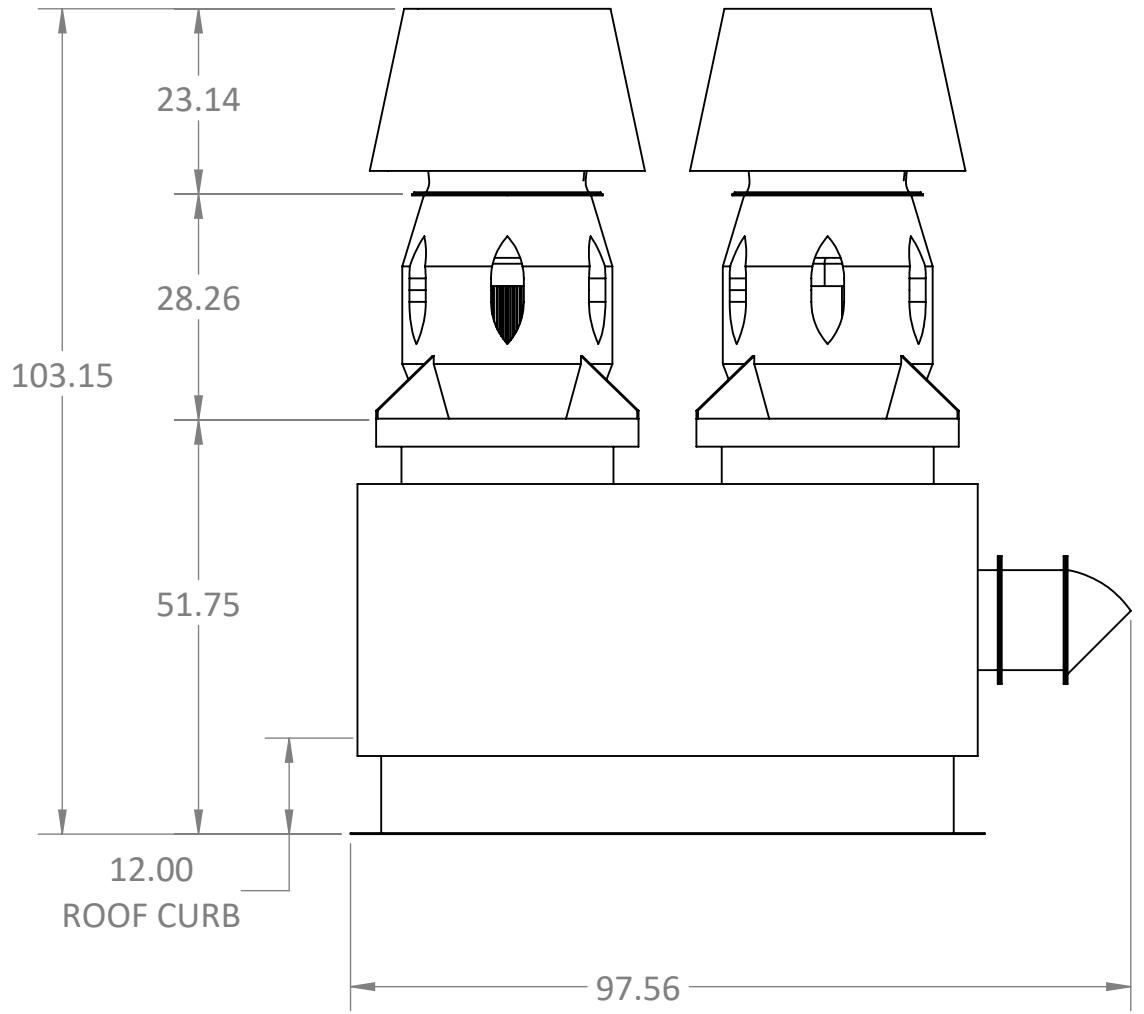
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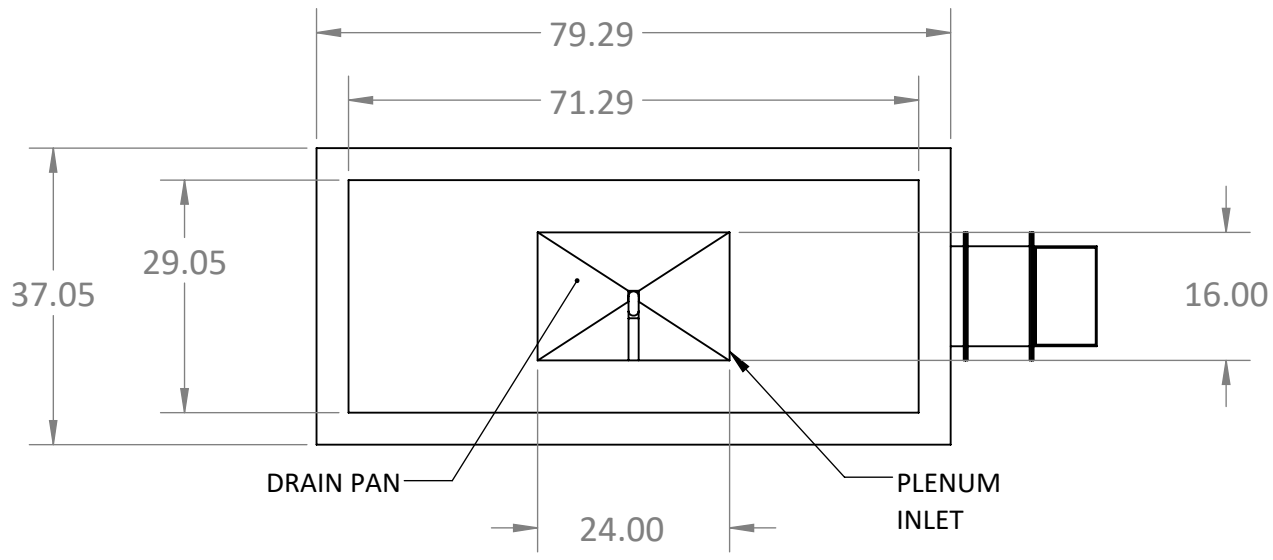
4 3 2 1

B



ESTIMATED WEIGHT - 1,250 LBS

A



UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: 31182-ALP-DMF150	
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL $\pm 1/8"$ ANGULAR: MACH \pm BEND \pm TWO PLACE DECIMAL \pm THREE PLACE DECIMAL \pm	DRAWN	C.B.	3/8/2023		
	CHECKED	Y.I.	3/8/2023		
	ENG APPR.				
	MFG APPR.				
INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:		SIZE	DWG. NO.	REV
MATERIAL			B	31182-1	0
NEXT ASSY	USED ON			SCALE: 1:24	SHEET 1 OF 1
APPLICATION		DO NOT SCALE DRAWING			



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NEXT ASSY	USED ON
APPLICATION	

4 3 2 1



Fan Model: DMF 150

Project: 2-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-702A/B

Wheel Size: 18.25 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 2970 CFM	Fan Power: 1.82 BHP	Altitude: 5800 ft
Inlet Pressure: 2.54 in. W.G	Fan Speed: 2886 RPM	Actual Density: 0.0606 lb/ft ³
Outlet Pressure: 0 in. W.G	Tip Speed: 13789 ft/min	Temperature: 70 °F
Fan E.S.P.: 2.54 in. W.G	Outlet Velocity: 1320 ft/min	

Dimensions Data (inches)

<p>Standard Options</p> <p>All Resin is Epoxy Vinyl Ester (Standard) Exterior is UV stable Interior corrosion resistant barrier with C-Veil All FRP: Rust Proof and UV Stable Housing / Inlet Cone: FRP Direct Drive AMCA Arrangement 4 Motor Protected From the Air Stream Outlet Connection - Flanged not drilled Inlet Connection - Slip Type Fasteners: 316 Stainless Steel Impellar - Mixed Flow (FRP) - Ø 18.25 Wheel Width: 100% Weather Resistant Duct Mounted Vertical Mount</p>	<p>Selected Options</p> <p>Double Wall FRP – Rust Proof construction, 2” insulation completely encapsulated in FRP, UV stable Exterior Fan FRP Construction Insulated FRP double wall construction – Rust-proof NEMA 3R disconnect - mounted and wired Damper Actuator - Mounted Bypass dampers - FRP construction Isolation dampers - FRP construction Graphite Lined - Spark Resistant Construction c/w Grounding Kit Double Veil for FRP Dampers Nexus lining 12" High Roof curb - Mild Steel FRP coated Plenum with Side inlet ALP Short nozzle size for 4500 FPM Exit velocity Equipment height restriction above roof surface - 120" including roof curb Required bypass volume 1570 CFM Hastelloy C bolts in the fan housing - QTY 5</p>
<p>Motor</p> <p>HP: 3 RPM: 3480 Voltage: 480 Enclosure: TEFC-Prem Efficient Frame: 182TC Hertz: 60 Phase: 3 Notes: Motor to be installed with helwig shaft grounding brush, VFD required by others</p>	



Plasticair

FAN COMPANY



GIF SERIES (BACKWARD INCLINED)



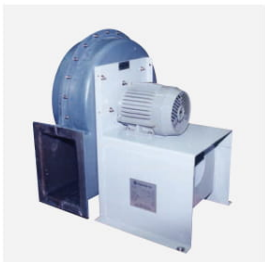
600 SERIES (PROPELLER)



BCMPA SERIES (BACKWARD CURVED)



700 SERIES (PROPELLER)



MINI SERIES (RADIAL & OPTION FOR BACKWARD INCLINED)



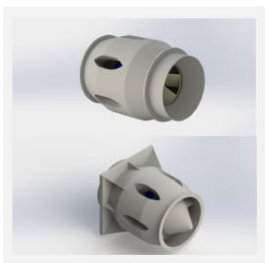
800 SERIES (BACKWARD INCLINED)



HPB SERIES (RADIAL BLADE)



900 SERIES (PROPELLER)



DMF SERIES (MIXED FLOW)





Fan Model: DMF 150

Project: 3-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-703A/B

FAN PERFORMANCE DATA		
Wheel Ø: 18.25 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 3180 CFM	Fan Power: 1.95 BHP	Altitude: 5800 ft
Fan Speed: 2965 RPM	Actual Density: 0.0606 lb/ft ³	Outlet Pressure: 0 in. W.G
Tip Speed: 14165 ft/min	Temperature: 70 °F	Fan E.S.P.: 2.49 in. W.G
Efficiency (Mechanical): 66 %	Efficiency (Static): 64 %	

SOUND DATA								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	77	81	85	87	90	87	79	72
Sound Pressure Levels 10 ft (A-weighted)	31	45	56	64	70	68	59	50
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	73							



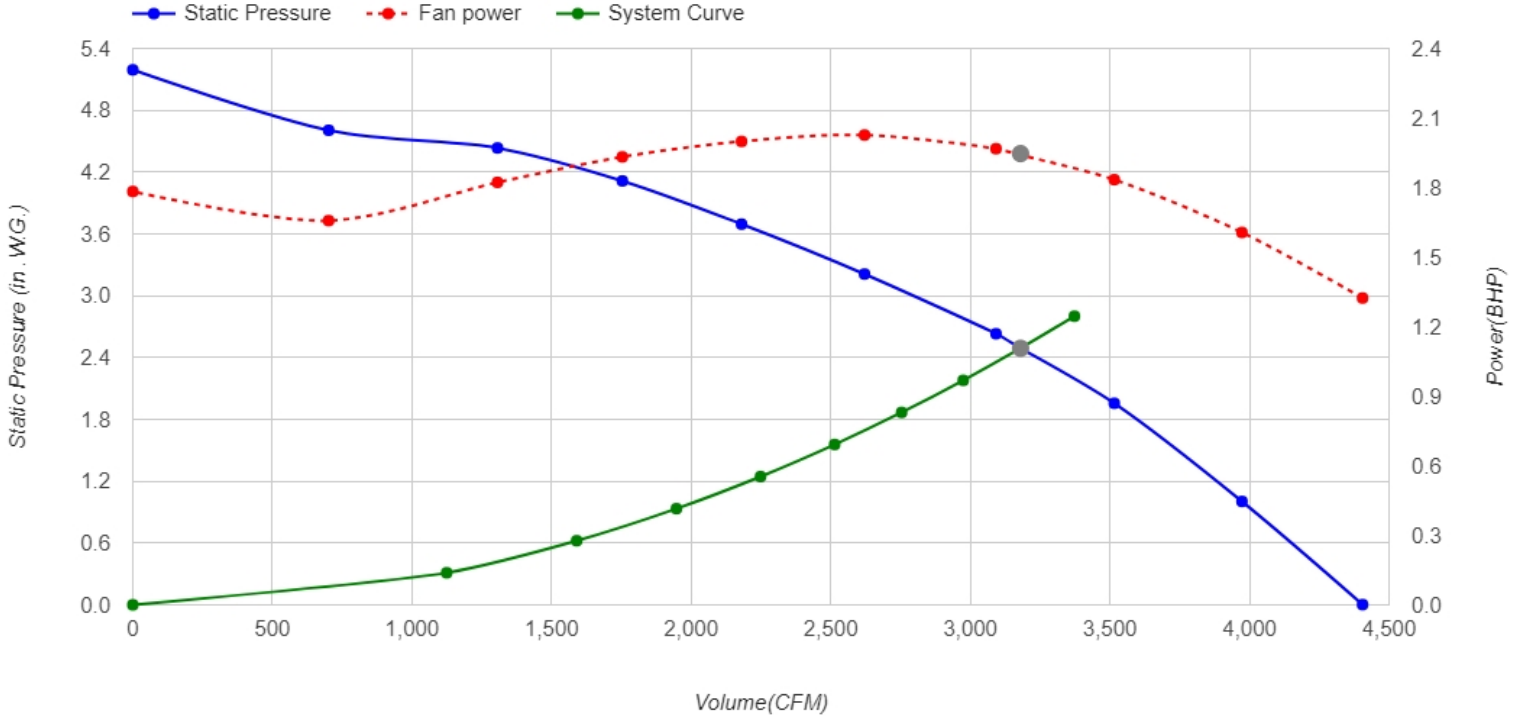
Customer:	0	Fan Tag:	HEF-703A/B
Rep:	CFM Company	Quote :	31182
Job ID:	CSM - EMRF - BLDG	Catalogued	October 2013

Silencer Insertion loss		Project Sound Performance							
Acoustic Windband insertion loss		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Select Silencer Size (Inch)									
Silencer Pressure Drop	in.w.g								
Inlet Sound Power Levels (dBA)		76	80	83	85	88	86	78	71
Outlet Sound Power Levels (dBA)		77	81	85	87	90	87	79	72
Inlet Sound Power levels are not AMCA Certified									



Fan Model: DMF 150

Project: 3-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-703A/B



FEI:1.31

CFM:3180	RPM: 2965	Static Pressure: 2.49 in. W.G	BHP: 1.95
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Sound Data								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	77	81	85	87	90	87	79	72
Sound Pressure Levels 10 ft (A-weighted)	31	45	56	64	70	68	59	50
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	73							

Surrounding Conditions	
Temperature (°F)	70
Altitude (ft.)	5800
Actual Density (lb/ft³)	0.0606
Actual Density (lb/ft³)	0.0606

Other Performance Data	
Tip Speed (ft/min)	14165
Fan Class	Class II
Efficiency (Mech)	66 %
Efficiency (Static)	64 %
Airstream Tem Change	1.79 °F
Wheel Width (%)	100
Outlet Velocity (ft/min)	1413



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ALP-DMF150- STACK PERFORMANCE DATA

Inlet Volume	3180	CFM
Induced Volume	1272	CFM
Windband Volume	4452	CFM
Dilution Ratio	140	%
Nozzle Velocity	4500	FPM
Windband Velocity	1463	FPM
Stack Pressure Drop	1.13	in.wg.
Effective Plume Rise at Inlet Volume - (Not Including Equipment)		
Plume Height (10 MPH)	14.55	ft
Plume Height (15 MPH)	9.70	ft
Plume Height (20 MPH)	7.28	ft
Effective Stack Height - Includes Equipment Height		
Crosswind	Effective Stack Height	
10 MPH	22.35	ft
15 MPH	17.50	ft
20 MPH	15.07	ft

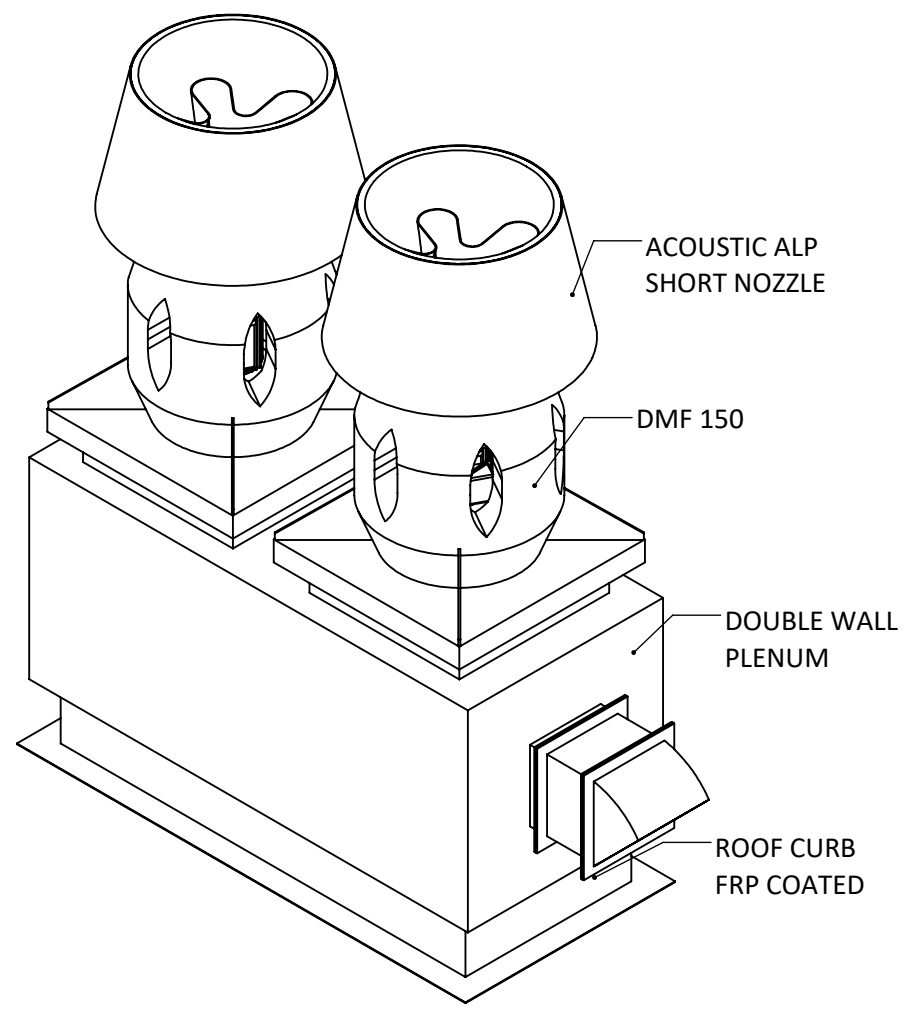
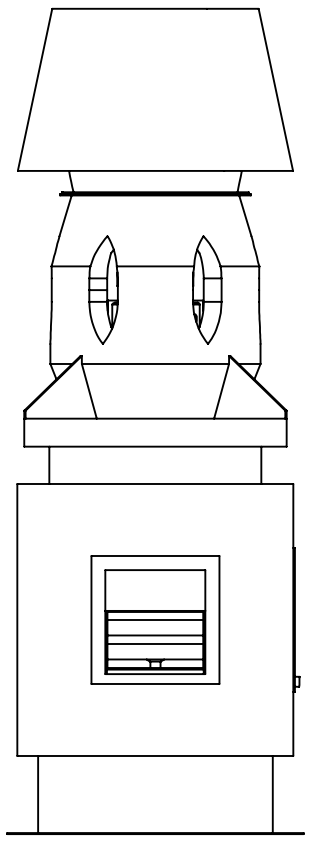
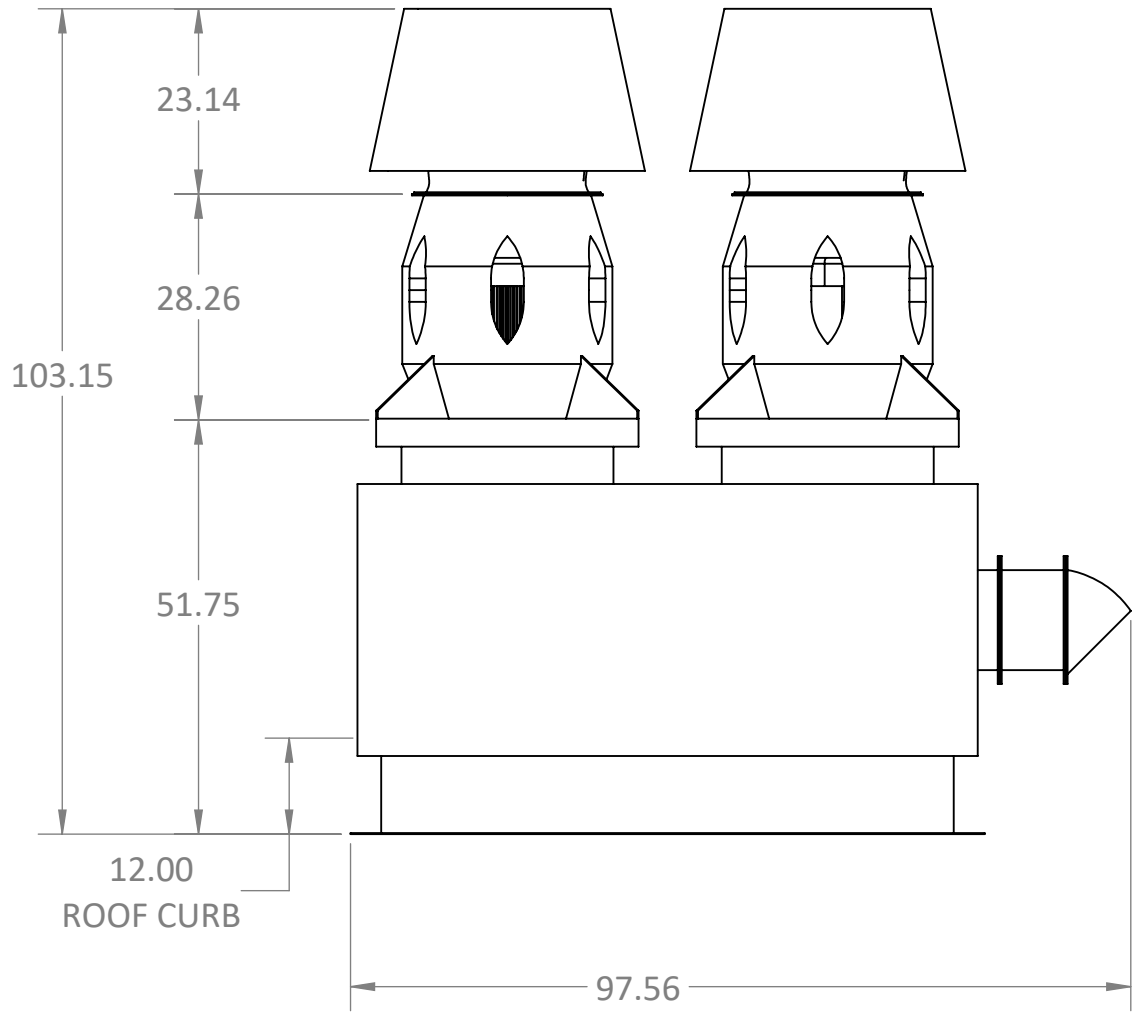
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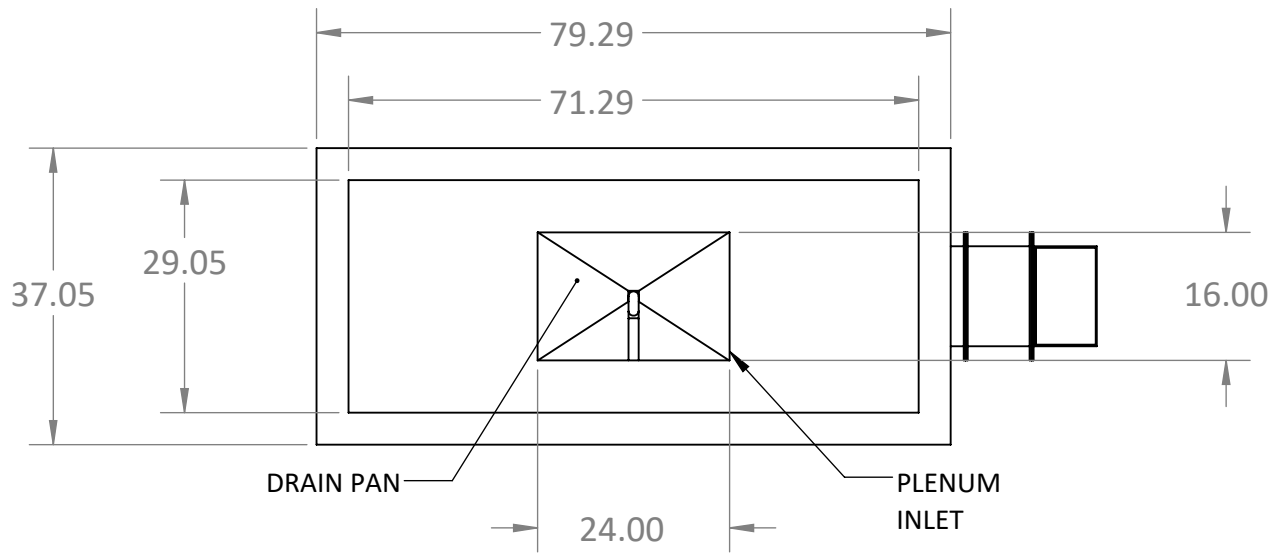
4 3 2 1

B



ESTIMATED WEIGHT - 1,250 LBS

A



UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: 31182-ALP-DMF150	
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL $\pm 1/8"$ ANGULAR: MACH \pm BEND \pm TWO PLACE DECIMAL \pm THREE PLACE DECIMAL \pm	DRAWN	C.B.	3/8/2023		
	CHECKED	Y.I.	3/8/2023		
	ENG APPR.				
	MFG APPR.				
INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:		SIZE	DWG. NO.	REV
MATERIAL			B	31182-1	0
NEXT ASSY	USED ON			SCALE: 1:24	SHEET 1 OF 1
APPLICATION		DO NOT SCALE DRAWING			



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NEXT ASSY	USED ON
APPLICATION	

4 3 2 1



Fan Model: DMF 150

Project: 3-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-703A/B

Wheel Size: 18.25 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 3180 CFM	Fan Power: 1.95 BHP	Altitude: 5800 ft
Inlet Pressure: 2.49 in. W.G	Fan Speed: 2965 RPM	Actual Density: 0.0606 lb/ft ³
Outlet Pressure: 0 in. W.G	Tip Speed: 14165 ft/min	Temperature: 70 °F
Fan E.S.P.: 2.49 in. W.G	Outlet Velocity: 1413 ft/min	

Dimensions Data (inches)

<p>Standard Options</p> <p>All Resin is Epoxy Vinyl Ester (Standard) Exterior is UV stable Interior corrosion resistant barrier with C-Veil All FRP: Rust Proof and UV Stable Housing / Inlet Cone: FRP Direct Drive AMCA Arrangement 4 Motor Protected From the Air Stream Outlet Connection - Flanged not drilled Inlet Connection - Slip Type Fasteners: 316 Stainless Steel Impellar - Mixed Flow (FRP) - Ø 18.25 Wheel Width: 100% Weather Resistant Duct Mounted Vertical Mount</p>	<p>Selected Options</p> <p>Double Wall FRP – Rust Proof construction, 2” insulation completely encapsulated in FRP, UV stable Exterior Fan FRP Construction Insulated FRP double wall construction – Rust proof NEMA 3R disconnect - mounted and wired Damper Actuator - Mounted Bypass dampers - FRP construction Isolation dampers - FRP construction Graphite Lined - Spark Resistant Construction c/w Grounding Kit Double Veil for FRP Dampers Nexus lining 12" High Roof curb - Mild Steel FRP coated Plenum with Side inlet ALP Short nozzle size for 4500 FPM Exit velocity Equipment height restriction above roof surface - 120" including roof curb Required bypass volume 0 CFM Hastelloy C bolts in the fan housing - QTY 5</p>
<p>Motor</p> <p>HP: 3 RPM: 3480 Voltage: 480 Enclosure: TEFC-Prem Efficient Frame: 182TC Hertz: 60 Phase: 3 Notes: Motor to be installed with helwig shaft grounding brush, VFD required by others</p>	



Plasticair

FAN COMPANY



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BCMPA SERIES (BACKWARD CURVED)



700 SERIES (PROPELLER)



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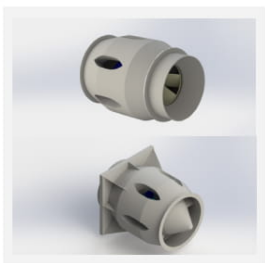
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HPB SERIES (RADIAL BLADE)



900 SERIES (PROPELLER)



DMF SERIES (MIXED FLOW)





Fan Model: DMF 150

Project: 4-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-704A/B

FAN PERFORMANCE DATA		
Wheel Ø: 18.25 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 2970 CFM	Fan Power: 1.75 BHP	Altitude: 5800 ft
Fan Speed: 2852 RPM	Actual Density: 0.0606 lb/ft ³	Outlet Pressure: 0 in. W.G
Tip Speed: 13628 ft/min	Temperature: 70 °F	Fan E.S.P.: 2.44 in. W.G
Efficiency (Mechanical): 67 %	Efficiency (Static): 65 %	

SOUND DATA								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	76	80	84	87	89	86	78	71
Sound Pressure Levels 10 ft (A-weighted)	30	44	55	63	69	66	58	49
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	72							



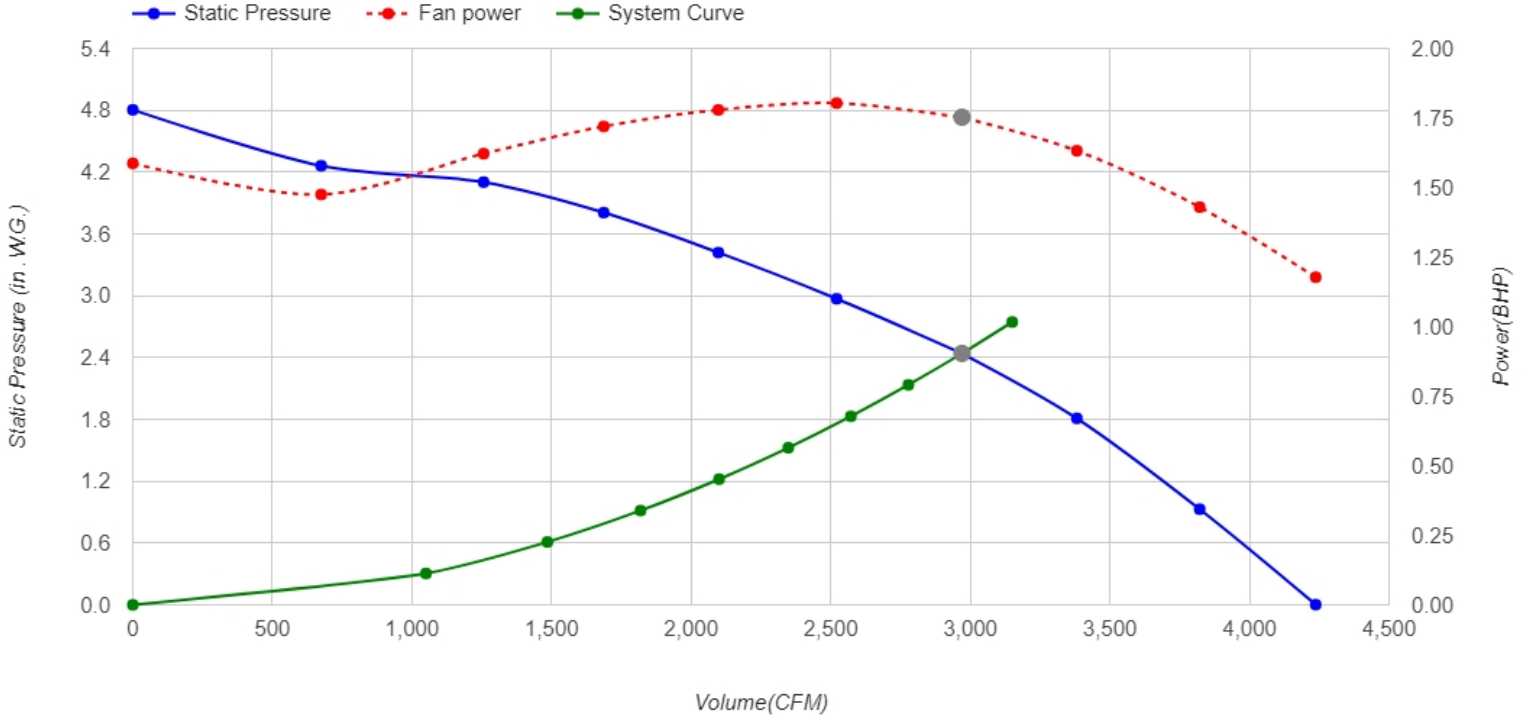
Customer:	0	Fan Tag:	HEF-704A/B
Rep:	CFM Company	Quote :	31182
Job ID:	CSM - EMRF - BLDG	Catalogoued	October 2013

Silencer Insertion loss		Project Sound Performance							
Acoustic Windband insertion loss		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Select Silencer Size (Inch)									
Silencer Pressure Drop	in.w.g								
Inlet Sound Power Levels (dBA)		75	79	82	85	87	85	77	70
Outlet Sound Power Levels (dBA)		76	80	84	87	89	86	78	71
Inlet Sound Power levels are not AMCA Certified									



Fan Model: DMF 150

Project: 4-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-704A/B



FEI:1.33

CFM:2970	RPM: 2852	Static Pressure: 2.44 in. W.G	BHP: 1.75
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Sound Data								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	76	80	84	87	89	86	78	71
Sound Pressure Levels 10 ft (A-weighted)	30	44	55	63	69	66	58	49
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	72							

Surrounding Conditions	
Temperature (°F)	70
Altitude (ft.)	5800
Actual Density (lb/ft ³)	0.0606
Actual Density (lb/ft ³)	0.0606

Other Performance Data	
Tip Speed (ft/min)	13628
Fan Class	Class II
Efficiency (Mech)	67 %
Efficiency (Static)	65 %
Airstream Tem Change	1.72 °F
Wheel Width (%)	100
Outlet Velocity (ft/min)	1320



Plasticair Inc. certifies that the DMF Mixed Flow Fans shown herein are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 210, publication 300, energy efficiency classification 205 and comply with the requirements of the AMCA certified ratings program.

dBa Data is not AMCA International Licensed
 dBA levels are not licensed by AMCA International
 Performance ratings do not include the effects of cross winds.
 Power Ratings (watts, kW, or bhp) does not include transmission losses.
 Performance ratings do not include the effects of appurtenances (accessories)
 The Sound Pressure Levels are based on a fan installation next to (No reflective surface)
 The sound Power level ratings shown are in decibels referred to 10-12 watts, calculated per AMCA International Standard 301
 Values shown are for (Outlet Lwo or Outlet LwoA) Sound Power Levels for: Installation Type C: Ducted Inlet, Free Outlet.
 The Environment for the fan installation effects the measure sound values, therefore the dBA levels cannot be guaranteed. A fans dBA is influenced by nearby sound reflecting surfaces. A-weighted Octave Band Sound Pressure levels (dBA) are not licensed by AMCA Intarnation. Please Consult AMCA publication 303 for more information.

ALP-DMF150- STACK PERFORMANCE DATA

Inlet Volume	2970	CFM
Induced Volume	1188	CFM
Windband Volume	4158	CFM
Dilution Ratio	140	%
Nozzle Velocity	4500	FPM
Windband Velocity	1366	FPM
Stack Pressure Drop	1.14	in.wg.
Effective Plume Rise at Inlet Volume - (Not Including Equipment)		
Plume Height (10 MPH)	14.06	ft
Plume Height (15 MPH)	9.38	ft
Plume Height (20 MPH)	7.03	ft
Effective Stack Height - Includes Equipment Height		
Crosswind	Effective Stack Height	
10 MPH	21.86	ft
15 MPH	17.17	ft
20 MPH	14.83	ft

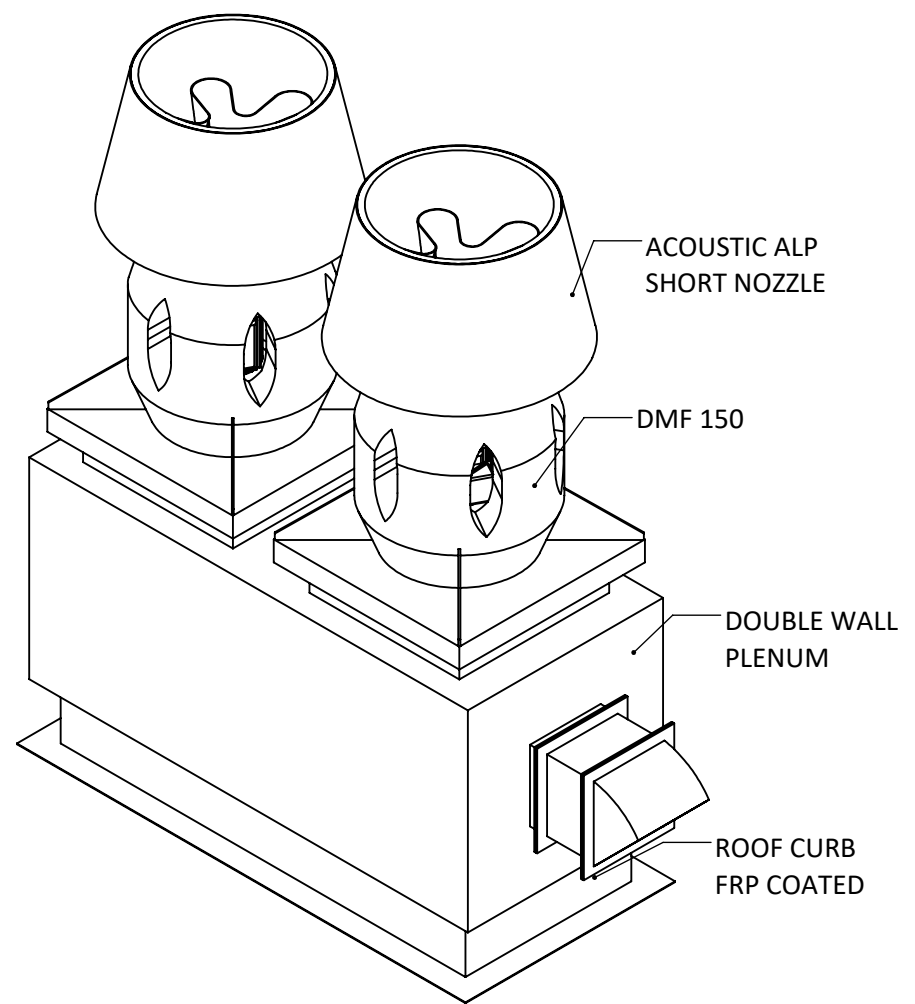
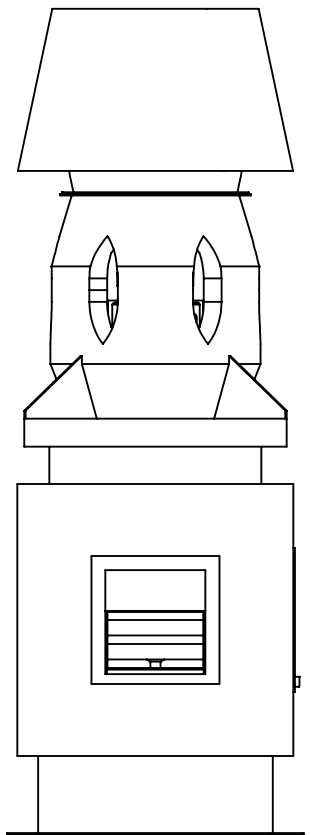
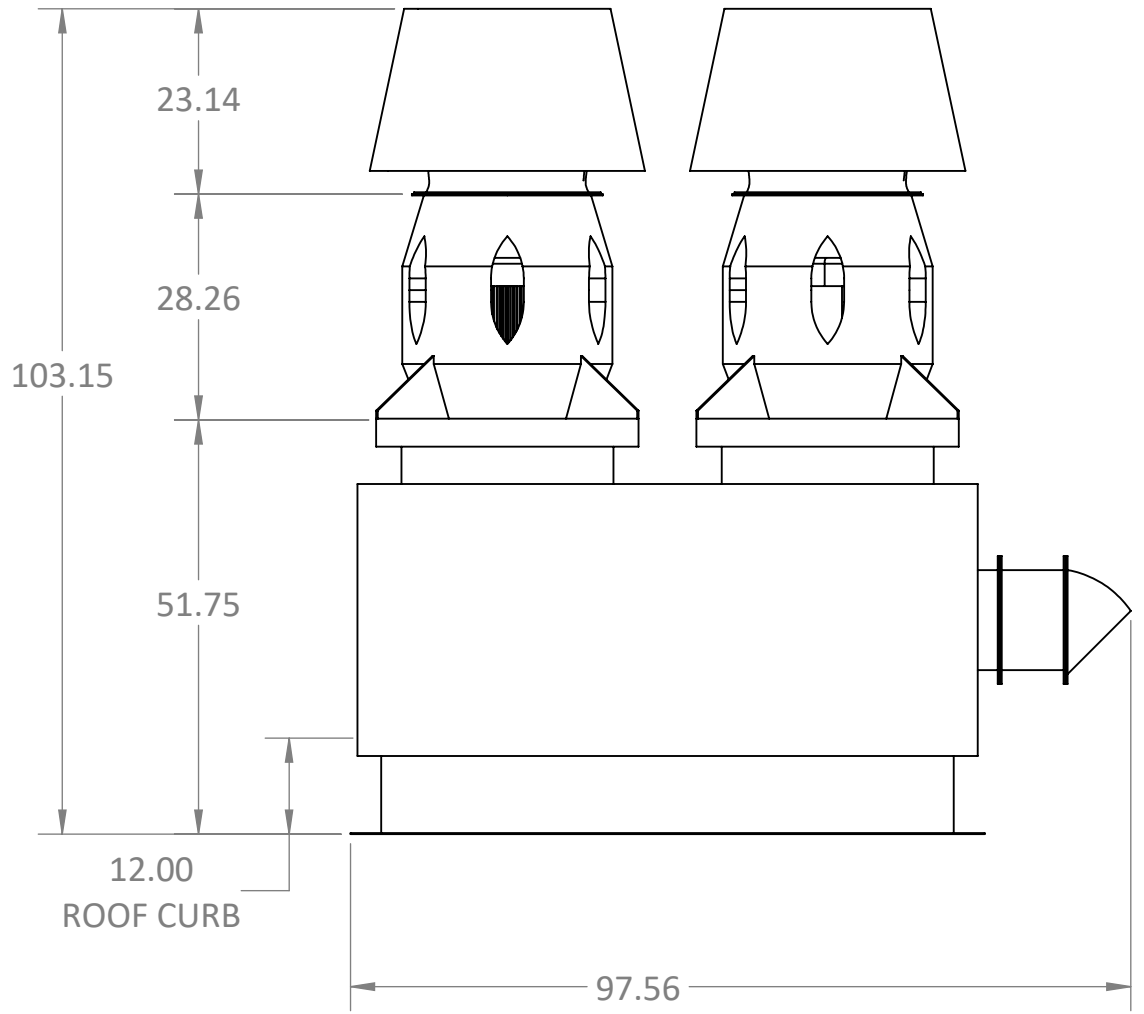
*- Performance ratings do not include the effects of appurtenances (accessories).

*- Power ratings (watts, kW, bhp) does not include transmission losses.

*- Performance ratings do not include the effects of cross winds.

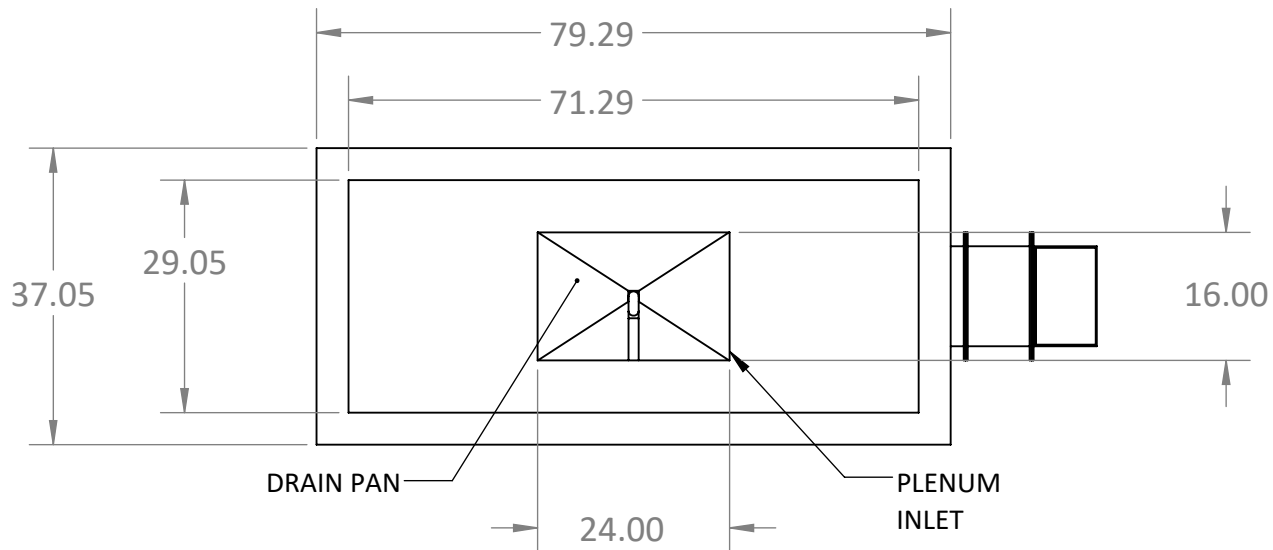
4 3 2 1

B



ESTIMATED WEIGHT - 1,250 LBS

A



DRAIN PAN

PLENUM INLET

24.00

UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: 31182-ALP-DMF150	
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL $\pm 1/8"$ ANGULAR: MACH \pm BEND \pm TWO PLACE DECIMAL \pm THREE PLACE DECIMAL \pm	DRAWN	C.B.	3/8/2023		
	CHECKED	Y.I.	3/8/2023		
	ENG APPR.				
	MFG APPR.				
INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:		SIZE	DWG. NO.	REV
MATERIAL			B	31182-1	0
NEXT ASSY	USED ON			SCALE: 1:24	SHEET 1 OF 1
APPLICATION		DO NOT SCALE DRAWING			



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NEXT ASSY	USED ON
APPLICATION	

4 3 2 1



Fan Model: DMF 150

Project: 4-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-704A/B

Wheel Size: 18.25 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 2970 CFM	Fan Power: 1.75 BHP	Altitude: 5800 ft
Inlet Pressure: 2.44 in. W.G	Fan Speed: 2852 RPM	Actual Density: 0.0606 lb/ft ³
Outlet Pressure: 0 in. W.G	Tip Speed: 13628 ft/min	Temperature: 70 °F
Fan E.S.P.: 2.44 in. W.G	Outlet Velocity: 1320 ft/min	

Dimensions Data (inches)

<p>Standard Options</p> <p>All Resin is Epoxy Vinyl Ester (Standard) Exterior is UV stable Interior corrosion resistant barrier with C-Veil All FRP: Rust Proof and UV Stable Housing / Inlet Cone: FRP Direct Drive AMCA Arrangement 4 Motor Protected From the Air Stream Outlet Connection - Flanged not drilled Inlet Connection - Slip Type Fasteners: 316 Stainless Steel Impellar - Mixed Flow (FRP) - Ø 18.25 Wheel Width: 100% Weather Resistant Duct Mounted Vertical Mount</p>	<p>Selected Options</p> <p>Double Wall FRP – Rust Proof construction, 2" insulation completely encapsulated in FRP, UV stable Exterior Fan FRP Construction Insulated FRP double wall construction – Rust-proof NEMA 3R disconnect - mounted and wired Damper Actuator - Mounted Bypass dampers - FRP construction Isolation dampers - FRP construction Graphite Lined - Spark Resistant Construction c/w Grounding Kit Double Veil for FRP Dampers Nexus lining 12" High Roof curb - Mild Steel FRP coated Plenum with Side inlet ALP Short nozzle size for 4500 FPM Exit velocity Equipment height restriction above roof surface - 120" including roof curb Required bypass volume 1380 CFM Hastelloy C - Bolts in the fan Housing - QTY 5</p>
<p>Motor</p> <p>HP: 3 RPM: 3480 Voltage: 480 Enclosure: TEFC-Prem Efficient Frame: 184TC Hertz: 60 Phase: 3 Notes: Motor to be installed with helwig shaft grounding brush, VFD required by others</p>	



Plasticair

FAN COMPANY



GIF SERIES (BACKWARD INCLINED)



600 SERIES (PROPELLER)



BCMPA SERIES (BACKWARD CURVED)



700 SERIES (PROPELLER)



MINI SERIES (RADIAL & OPTION FOR BACKWARD INCLINED)



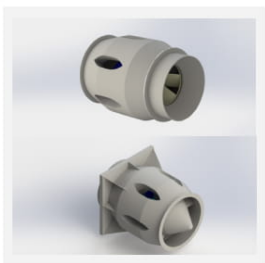
800 SERIES (BACKWARD INCLINED)



HPB SERIES (RADIAL BLADE)



900 SERIES (PROPELLER)



DMF SERIES (MIXED FLOW)





Fan Model: DMF 200

Project: 5-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-705A/B

FAN PERFORMANCE DATA		
Wheel Ø: 24.5 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 5420 CFM	Fan Power: 4.63 BHP	Altitude: 5800 ft
Fan Speed: 2392 RPM	Actual Density: 0.0606 lb/ft ³	Outlet Pressure: 0 in. W.G
Tip Speed: 15342 ft/min	Temperature: 70 °F	Fan E.S.P.: 3.54 in. W.G
Efficiency (Mechanical): 67 %	Efficiency (Static): 65 %	

SOUND DATA								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	86	90	93	94	92	86	80	74
Sound Pressure Levels 10 ft (A-weighted)	40	54	64	71	72	66	61	52
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	75							



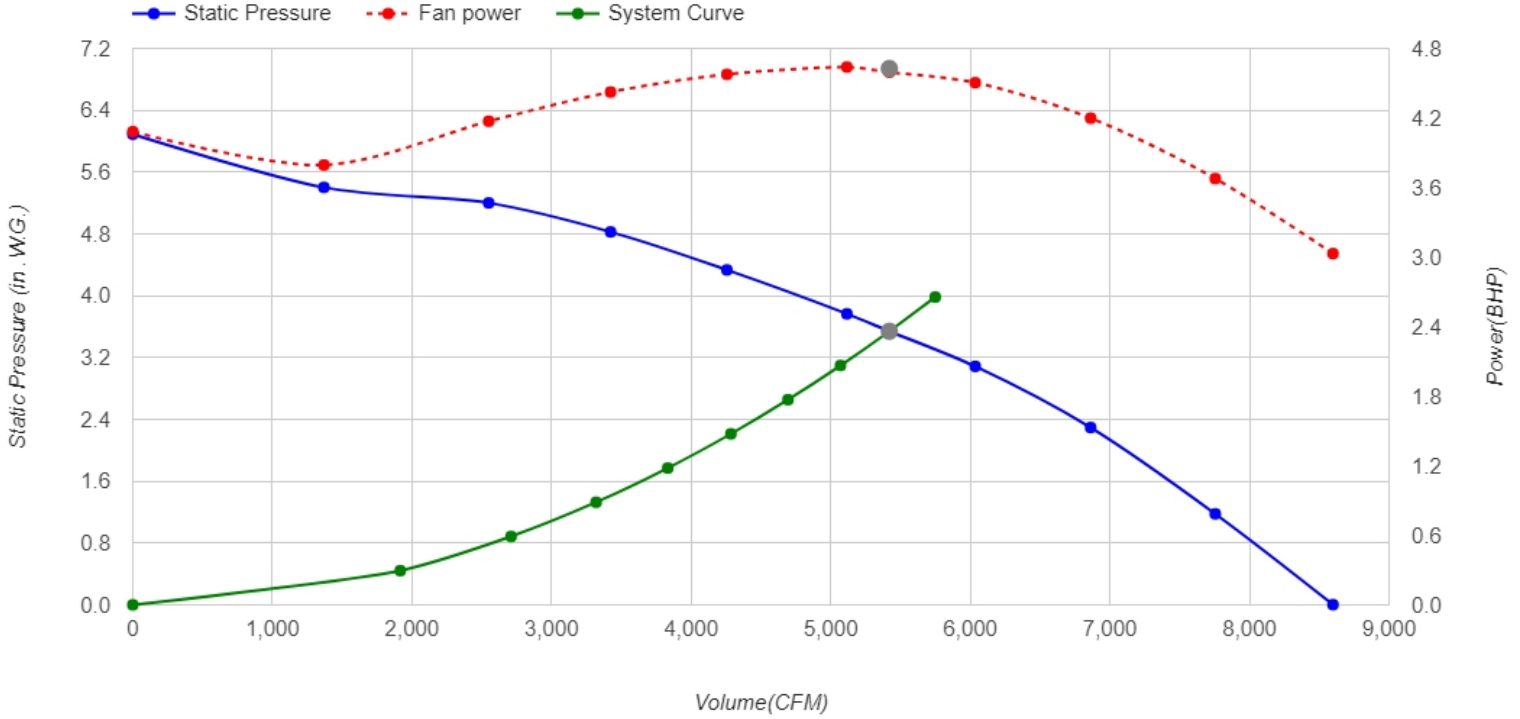
Customer:	0	Fan Tag:	HEF-705A/B
Rep:	CFM Company	Quote :	31182
Job ID:	CSM - EMRF - BLDG	Catalogued	October 2013

Silencer Insertion loss		Project Sound Performance							
Acoustic Windband insertion loss		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Select Silencer Size (Inch)									
Silencer Pressure Drop	in.w.g								
Inlet Sound Power Levels (dBA)		85	89	91	92	90	85	79	73
Outlet Sound Power Levels (dBA)		86	90	93	94	92	86	80	74
Inlet Sound Power levels are not AMCA Certified									



Fan Model: DMF 200

Project: 5-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-705A/B



FEI:1.34

CFM:5420	RPM: 2392	Static Pressure: 3.54 in. W.G	BHP: 4.63
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Sound Data								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	86	90	93	94	92	86	80	74
Sound Pressure Levels 10 ft (A-weighted)	40	54	64	71	72	66	61	52
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	75							

Surrounding Conditions	
Temperature (°F)	70
Altitude (ft.)	5800
Actual Density (lb/ft³)	0.0606
Actual Density (lb/ft³)	0.0606

Other Performance Data	
Tip Speed (ft/min)	15342
Fan Class	Class III
Efficiency (Mech)	67 %
Efficiency (Static)	65 %
Airstream Tem Change	2.49 °F
Wheel Width (%)	100
Outlet Velocity (ft/min)	1342



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 The sound Power level ratings shown are in decibels referred to 10-12 watts, calculated per AMCA International Standard 301
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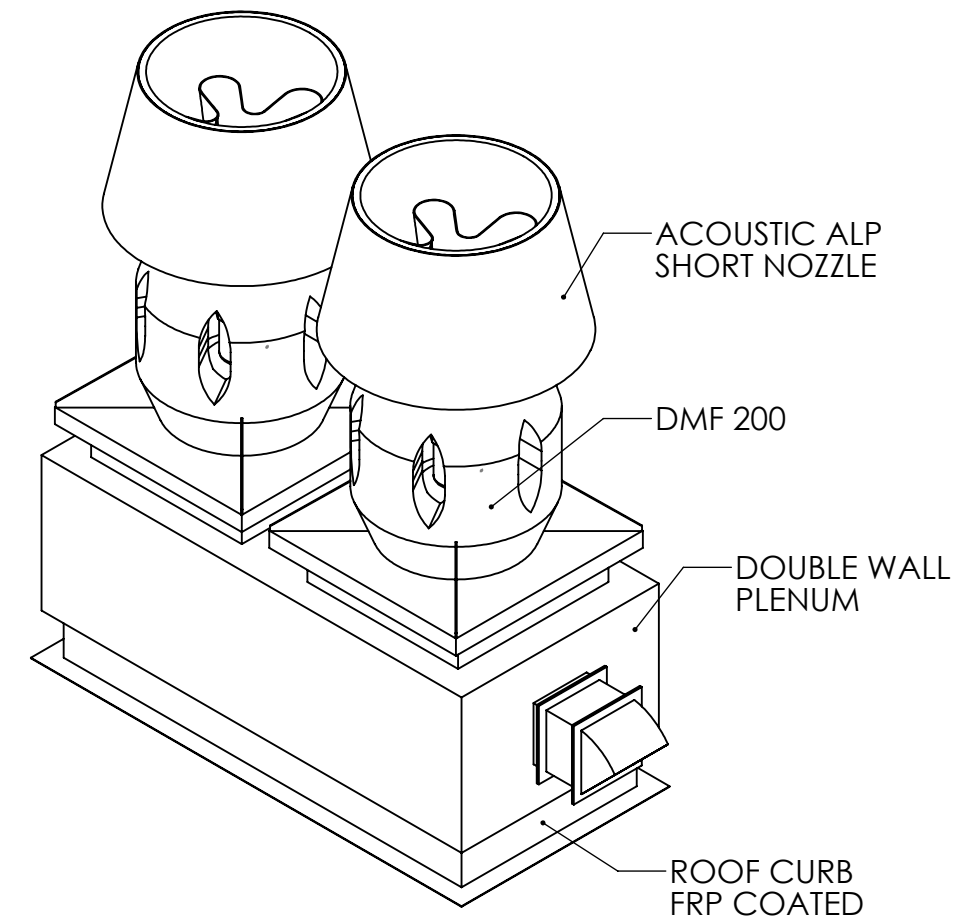
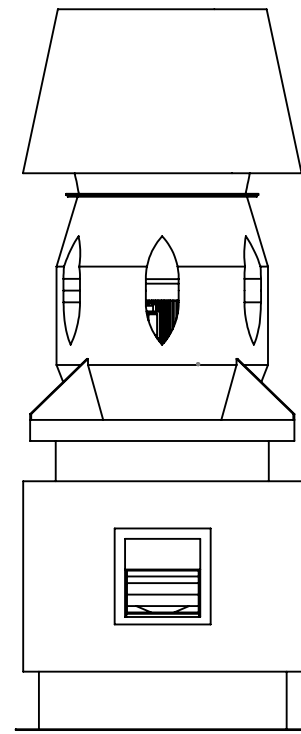
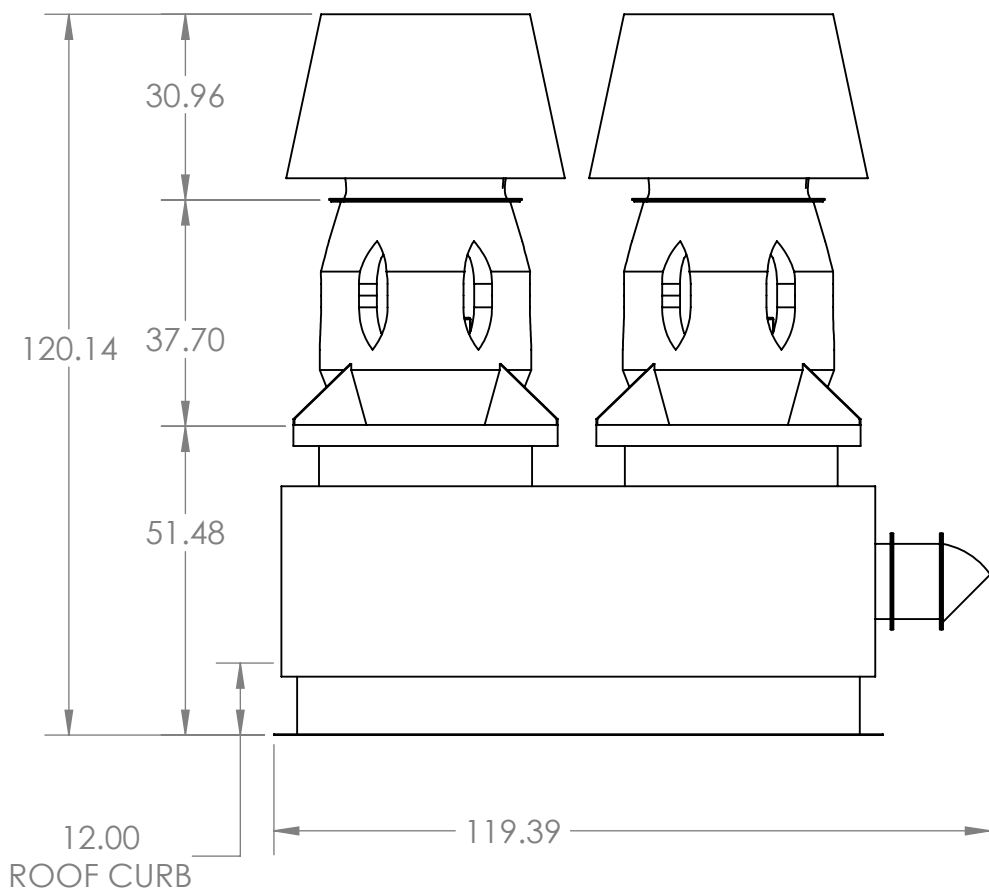
ALP-DMF200- STACK PERFORMANCE DATA

Inlet Volume	5420	CFM
Induced Volume	2168	CFM
Windband Volume	7588	CFM
Dilution Ratio	140	%
Nozzle Velocity	4500	FPM
Windband Velocity	1368	FPM
Stack Pressure Drop	1.14	in.wg.
Effective Plume Rise at Inlet Volume - (Not Including Equipment)		
Plume Height (10 MPH)	19.00	ft
Plume Height (15 MPH)	12.67	ft
Plume Height (20 MPH)	9.50	ft
Effective Stack Height - Includes Equipment Height		
Crosswind	Effective Stack Height	
10 MPH	27.93	ft
15 MPH	21.60	ft
20 MPH	18.43	ft

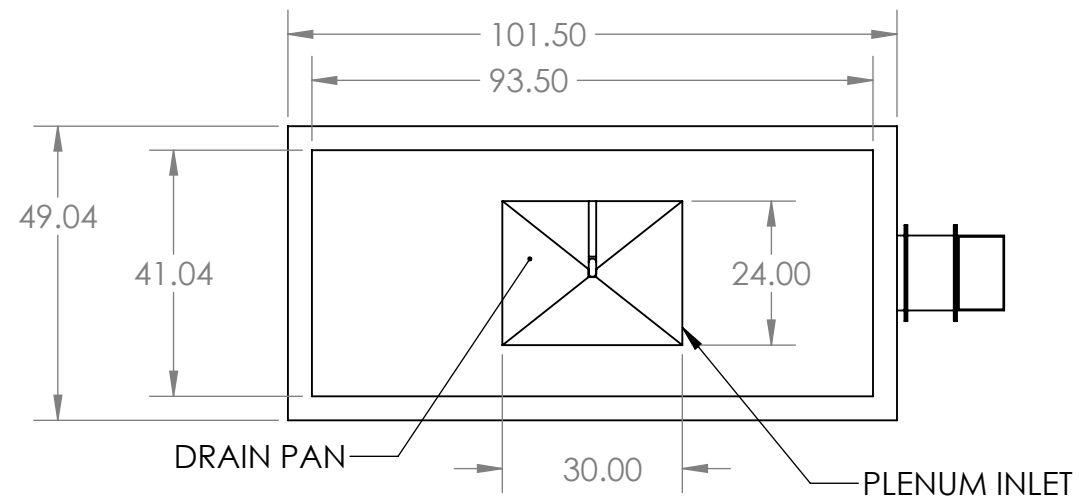
*- Performance ratings do not include the effects of appurtenances (accessories).

*- Power ratings (watts, kW, bhp) does not include transmission losses.

*- Performance ratings do not include the effects of cross winds.



ESTIMATED WEIGHT - 1,825 LBS



UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: 32118-ALP-DMF200	
DIMENSIONS ARE IN INCHES		DRAWN	C.B.		3/8/2023
TOLERANCES:		CHECKED	Y.I.		3/8/2023
FRACTIONAL: ± 1/8"		ENG APPR.			
ANGULAR: MACH ±		MFG APPR.			
BEND ±					
TWO PLACE DECIMAL ±					
THREE PLACE DECIMAL ±					
INTERPRET GEOMETRIC TOLERANCING PER:		COMMENTS:		SIZE	
MATERIAL				DWG. NO.	
NEXT ASSY	USED ON			REV	
APPLICATION		DO NOT SCALE DRAWING		0	
				SCALE: 1:32	
				SHEET 1 OF 1	



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4

3

2

1

B

B

A

A



Fan Model: DMF 200

Project: 5-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-705A/B

Wheel Size: 24.5 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 5420 CFM	Fan Power: 4.63 BHP	Altitude: 5800 ft
Inlet Pressure: 3.54 in. W.G	Fan Speed: 2392 RPM	Actual Density: 0.0606 lb/ft ³
Outlet Pressure: 0 in. W.G	Tip Speed: 15342 ft/min	Temperature: 70 °F
Fan E.S.P.: 3.54 in. W.G	Outlet Velocity: 1342 ft/min	

Dimensions Data (inches)

<p>Standard Options</p> <p>All Resin is Epoxy Vinyl Ester (Standard) Exterior is UV stable Interior corrosion resistant barrier with C-Veil All FRP: Rust Proof and UV Stable Housing / Inlet Cone: FRP Direct Drive AMCA Arrangement 4 Motor Protected From the Air Stream Outlet Connection - Flanged not drilled Inlet Connection - Slip Type Fasteners: 316 Stainless Steel Impellar - Mixed Flow (FRP) - Ø 24.5 Wheel Width: 100% Weather Resistant Duct Mounted Vertical Mount</p>	<p>Selected Options</p> <p>Double Wall FRP – Rust Proof construction, 2” insulation completely encapsulated in FRP, UV stable Exterior Fan FRP Construction Insulated FRP double wall construction – Rust proof NEMA 3R disconnect - mounted and wired Damper Actuator - Mounted Bypass dampers - FRP construction Isolation dampers - FRP construction Graphite Lined - Spark Resistant Construction c/w Grounding Kit Double Veil for FRP Dampers Nexus lining 12" High Roof curb - Mild Steel FRP coated Plenum with Side inlet ALP Short nozzle size for 4500 FPM Exit velocity Equipment height restriction above roof surface - 120" including roof curb Required bypass volume 0 CFM Hastelloy C bolts in the fan housing - QTY 5</p>
<p>Motor</p> <p>HP: 7.5 RPM: 1800 Voltage: 480 Enclosure: TEFC-Prem Efficient Frame: 213TC Hertz: 60 Phase: 3 Notes: Motor to be installed with helwig shaft grounding brush, VFD required by others</p>	



Plasticair

FAN COMPANY



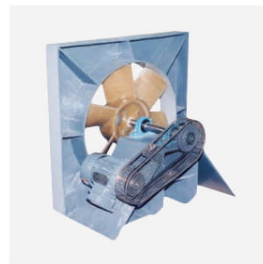
GIF SERIES (BACKWARD INCLINED)



600 SERIES (PROPELLER)



BCMPA SERIES (BACKWARD CURVED)



700 SERIES (PROPELLER)



MINI SERIES (RADIAL & OPTION FOR BACKWARD INCLINED)



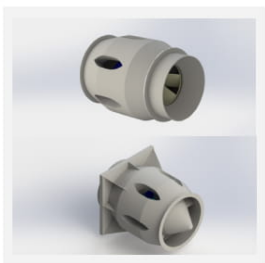
800 SERIES (BACKWARD INCLINED)



HPB SERIES (RADIAL BLADE)



900 SERIES (PROPELLER)



DMF SERIES (MIXED FLOW)





Fan Model: DMF 150

Project: 6-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-706A/B

FAN PERFORMANCE DATA		
Wheel Ø: 18.25 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 3360 CFM	Fan Power: 2 BHP	Altitude: 5800 ft
Fan Speed: 3012 RPM	Actual Density: 0.0606 lb/ft ³	Outlet Pressure: 0 in. W.G
Tip Speed: 14390 ft/min	Temperature: 70 °F	Fan E.S.P.: 2.36 in. W.G
Efficiency (Mechanical): 65 %	Efficiency (Static): 62 %	

SOUND DATA								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	77	81	85	88	91	88	79	72
Sound Pressure Levels 10 ft (A-weighted)	31	45	56	64	70	68	60	51
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	73							



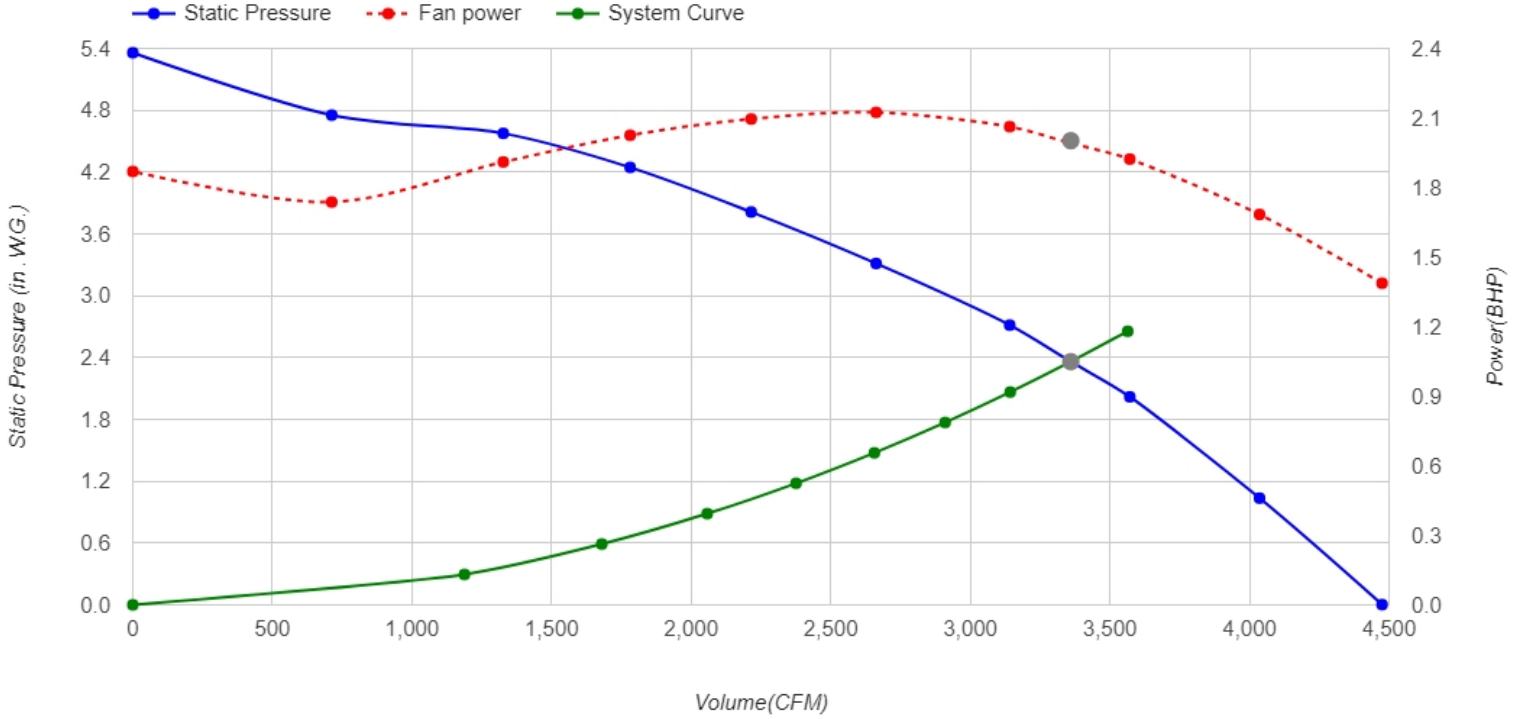
Customer:	0	Fan Tag:	HEF-706A/B
Rep:	CFM Company	Quote :	31182
Job ID:	CSM - EMRF - BLDG	Catalogued	October 2013

Silencer Insertion loss		Project Sound Performance							
Acoustic Windband insertion loss		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Select Silencer Size (Inch)									
Silencer Pressure Drop	in.w.g								
Inlet Sound Power Levels (dBA)		76	80	83	86	89	87	78	71
Outlet Sound Power Levels (dBA)		77	81	85	88	91	88	79	72
Inlet Sound Power levels are not AMCA Certified									



Fan Model: DMF 150

Project: 6-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-706A/B



FEI:1.23

CFM:3360	RPM: 3012	Static Pressure: 2.36 in. W.G	BHP: 2
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Sound Data								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	77	81	85	88	91	88	79	72
Sound Pressure Levels 10 ft (A-weighted)	31	45	56	64	70	68	60	51
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	73							

Surrounding Conditions	
Temperature (°F)	70
Altitude (ft.)	5800
Actual Density (lb/ft ³)	0.0606
Actual Density (lb/ft ³)	0.0606

Other Performance Data	
Tip Speed (ft/min)	14390
Fan Class	Class II
Efficiency (Mech)	65 %
Efficiency (Static)	62 %
Airstream Tem Change	1.74 °F
Wheel Width (%)	100
Outlet Velocity (ft/min)	1493



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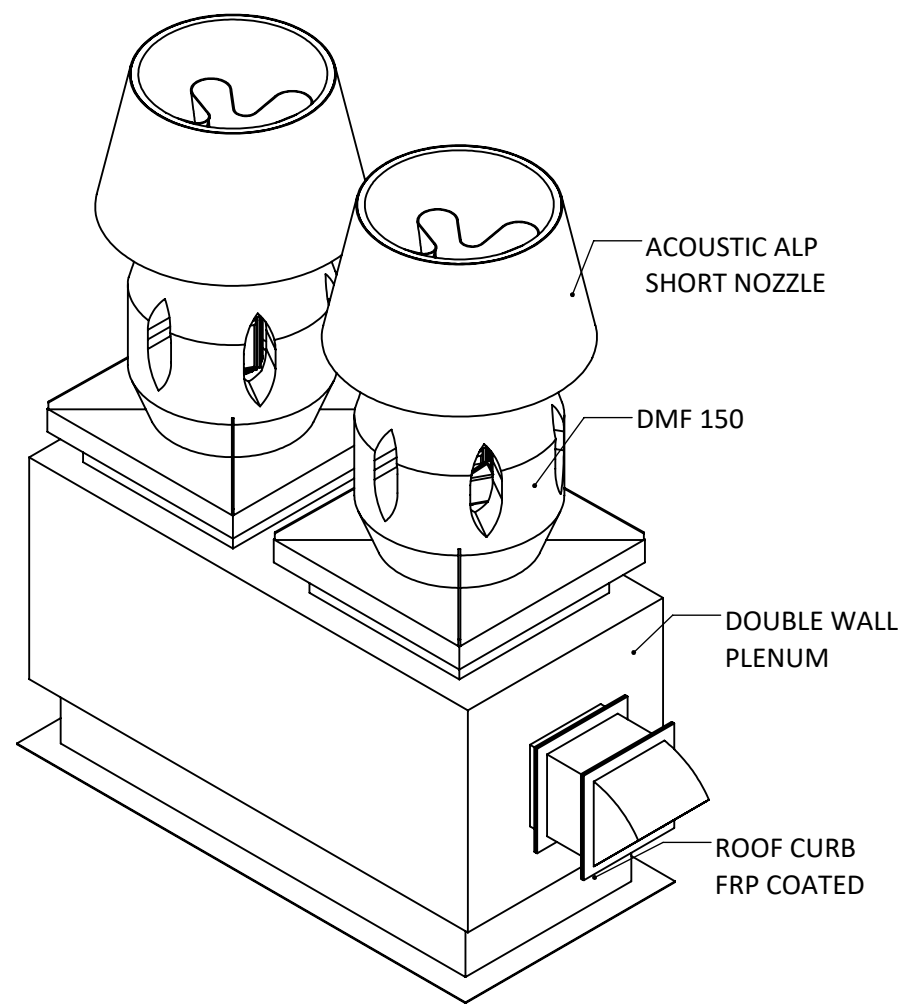
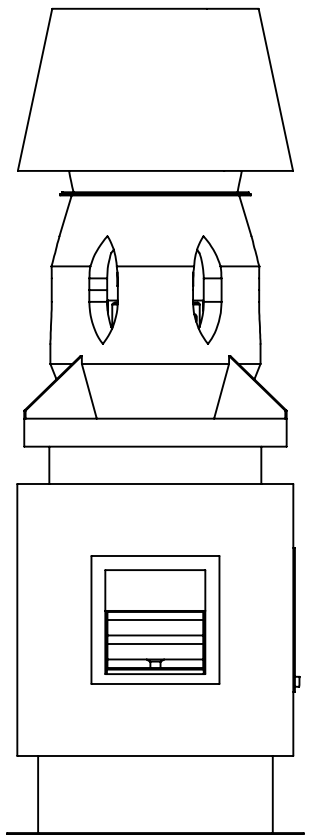
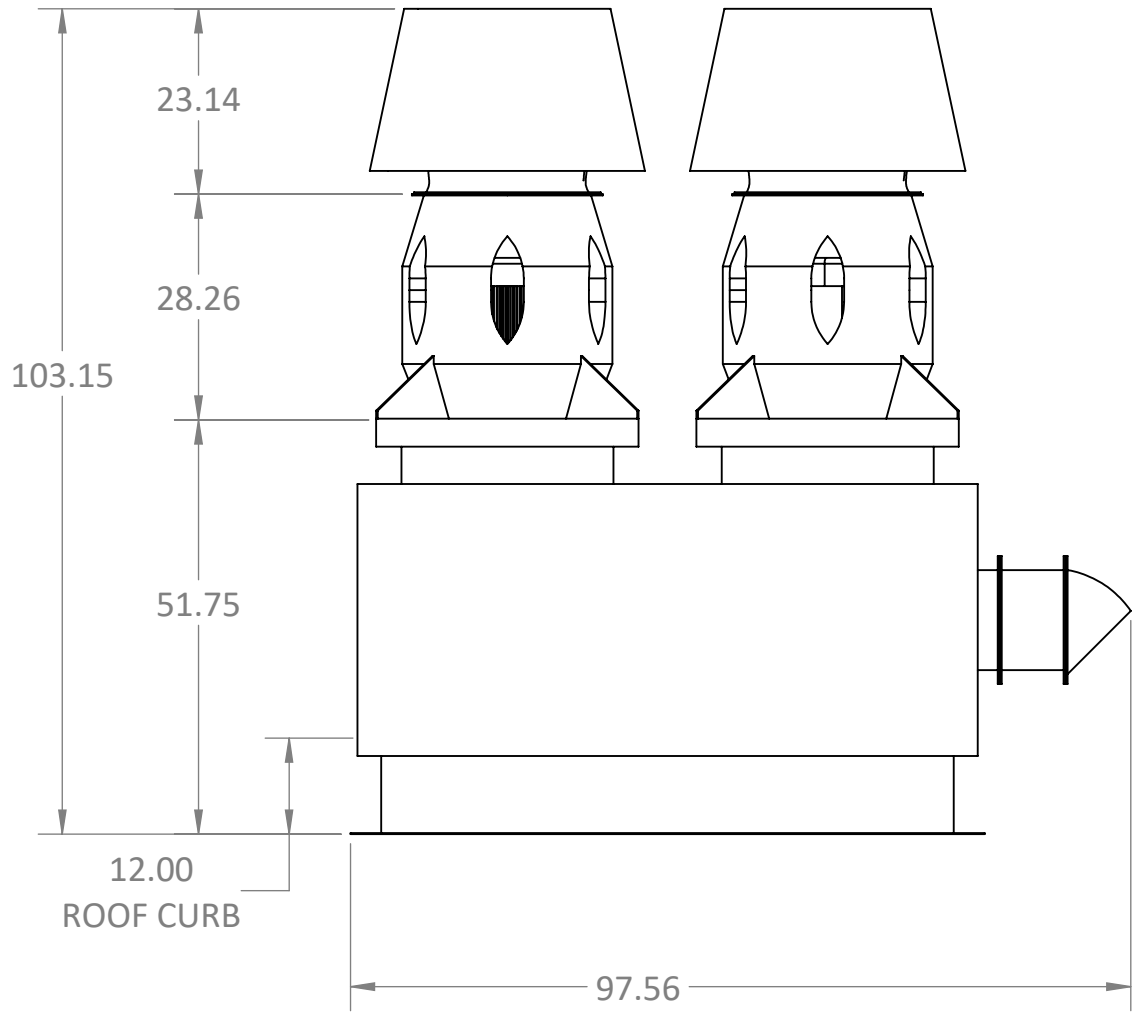
ALP-DMF150- STACK PERFORMANCE DATA

Inlet Volume	3360	CFM
Induced Volume	1344	CFM
Windband Volume	4704	CFM
Dilution Ratio	140	%
Nozzle Velocity	4500	FPM
Windband Velocity	1546	FPM
Stack Pressure Drop	1.11	in.wg.
Effective Plume Rise at Inlet Volume - (Not Including Equipment)		
Plume Height (10 MPH)	14.96	ft
Plume Height (15 MPH)	9.97	ft
Plume Height (20 MPH)	7.48	ft
Effective Stack Height - Includes Equipment Height		
Crosswind	Effective Stack Height	
10 MPH	22.75	ft
15 MPH	17.77	ft
20 MPH	15.27	ft

- *- Performance ratings do not include the effects of appurtenances (accessories).
- *- Power ratings (watts, kW, bhp) does not include transmission losses.
- *- Performance ratings do not include the effects of cross winds.

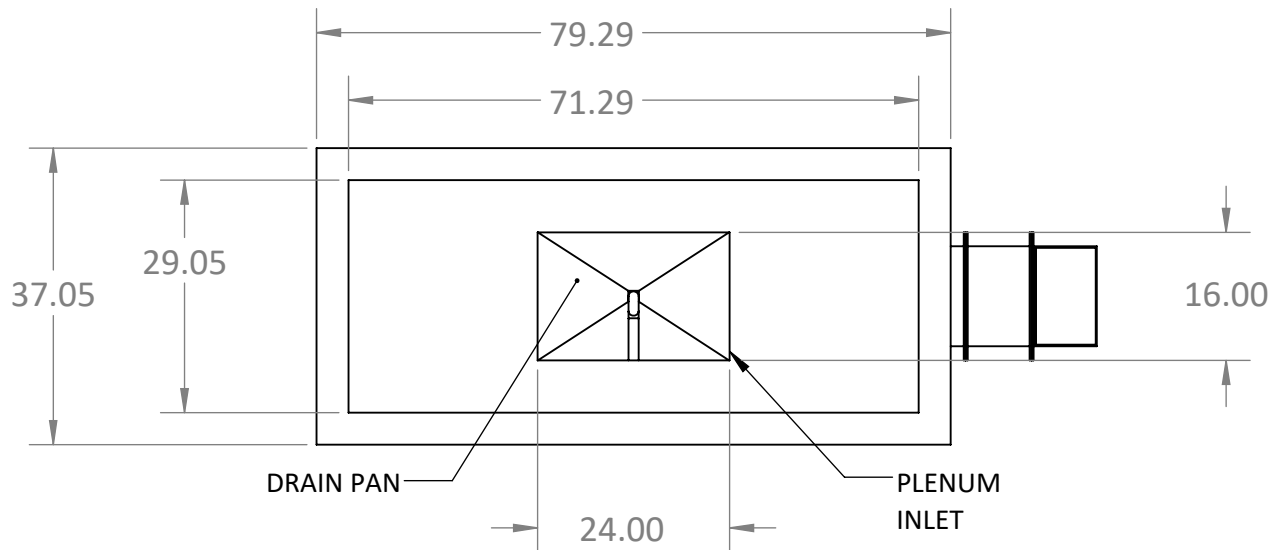
4 3 2 1

B



ESTIMATED WEIGHT - 1,250 LBS

A



DRAIN PAN

PLENUM INLET

24.00

UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: 31182-ALP-DMF150	
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL $\pm 1/8"$ ANGULAR: MACH \pm BEND \pm TWO PLACE DECIMAL \pm THREE PLACE DECIMAL \pm	DRAWN	C.B.	3/8/2023		
	CHECKED	Y.I.	3/8/2023		
	ENG APPR.				
	MFG APPR.				
INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:		SIZE	DWG. NO.	REV
MATERIAL			B	31182-1	0
NEXT ASSY	USED ON			SCALE: 1:24	SHEET 1 OF 1
APPLICATION		DO NOT SCALE DRAWING			



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NEXT ASSY	USED ON
APPLICATION	

4 3 2 1



Fan Model: DMF 150

Project: 6-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-706A/B

Wheel Size: 18.25 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 3360 CFM	Fan Power: 2 BHP	Altitude: 5800 ft
Inlet Pressure: 2.36 in. W.G	Fan Speed: 3012 RPM	Actual Density: 0.0606 lb/ft ³
Outlet Pressure: 0 in. W.G	Tip Speed: 14390 ft/min	Temperature: 70 °F
Fan E.S.P.: 2.36 in. W.G	Outlet Velocity: 1493 ft/min	

Dimensions Data (inches)

<p>Standard Options</p> <p>All Resin is Epoxy Vinyl Ester (Standard) Exterior is UV stable Interior corrosion resistant barrier with C-Veil All FRP: Rust Proof and UV Stable Housing / Inlet Cone: FRP Direct Drive AMCA Arrangement 4 Motor Protected From the Air Stream Outlet Connection - Flanged not drilled Inlet Connection - Slip Type Fasteners: 316 Stainless Steel Impellar - Mixed Flow (FRP) - Ø 18.25 Wheel Width: 100% Weather Resistant Duct Mounted Vertical Mount</p>	<p>Selected Options</p> <p>Double Wall FRP – Rust Proof construction, 2” insulation completely encapsulated in FRP, UV stable Exterior Fan FRP Construction Insulated FRP double wall construction – Rust-proof NEMA 3R disconnect - mounted and wired Damper Actuator - Mounted Bypass dampers - FRP construction Isolation dampers - FRP construction Graphite Lined - Spark Resistant Construction c/w Grounding Kit Double Veil for FRP Dampers Nexus lining 12" High Roof curb - Mild Steel FRP coated Plenum with Side inlet ALP Short nozzle size for 4500 FPM Exit velocity Equipment height restriction above roof surface - 120" including roof curb Required bypass volume 0 CFM Hastelloy C bolts in fan housing - QTY 5</p>
<p>Motor</p> <p>HP: 3 RPM: 3480 Voltage: 480 Enclosure: TEFC-Prem Efficient Frame: 182TC Hertz: 60 Phase: 3 Notes: Motor to be installed with helwig shaft grounding brush, VFD required by others</p>	



Plasticair

FAN COMPANY



GIF SERIES (BACKWARD INCLINED)



600 SERIES (PROPELLER)



BCMPA SERIES (BACKWARD CURVED)



700 SERIES (PROPELLER)



MINI SERIES (RADIAL & OPTION FOR BACKWARD INCLINED)



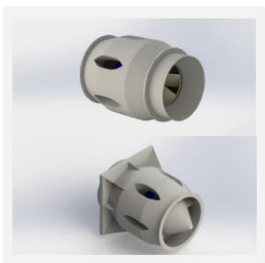
800 SERIES (BACKWARD INCLINED)



HPB SERIES (RADIAL BLADE)



900 SERIES (PROPELLER)



DMF SERIES (MIXED FLOW)





Fan Model: DMF 200

Project: 7-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-707A/B

FAN PERFORMANCE DATA		
Wheel Ø: 24.5 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 4960 CFM	Fan Power: 3.28 BHP	Altitude: 5800 ft
Fan Speed: 2135 RPM	Actual Density: 0.0606 lb/ft ³	Outlet Pressure: 0 in. W.G
Tip Speed: 13694 ft/min	Temperature: 70 °F	Fan E.S.P.: 2.74 in. W.G
Efficiency (Mechanical): 67 %	Efficiency (Static): 65 %	

SOUND DATA								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	84	89	91	92	89	82	77	70
Sound Pressure Levels 10 ft (A-weighted)	38	53	62	68	68	63	57	49
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	73							



Plasticair
FAN COMPANY

DMF 200
Rooftop

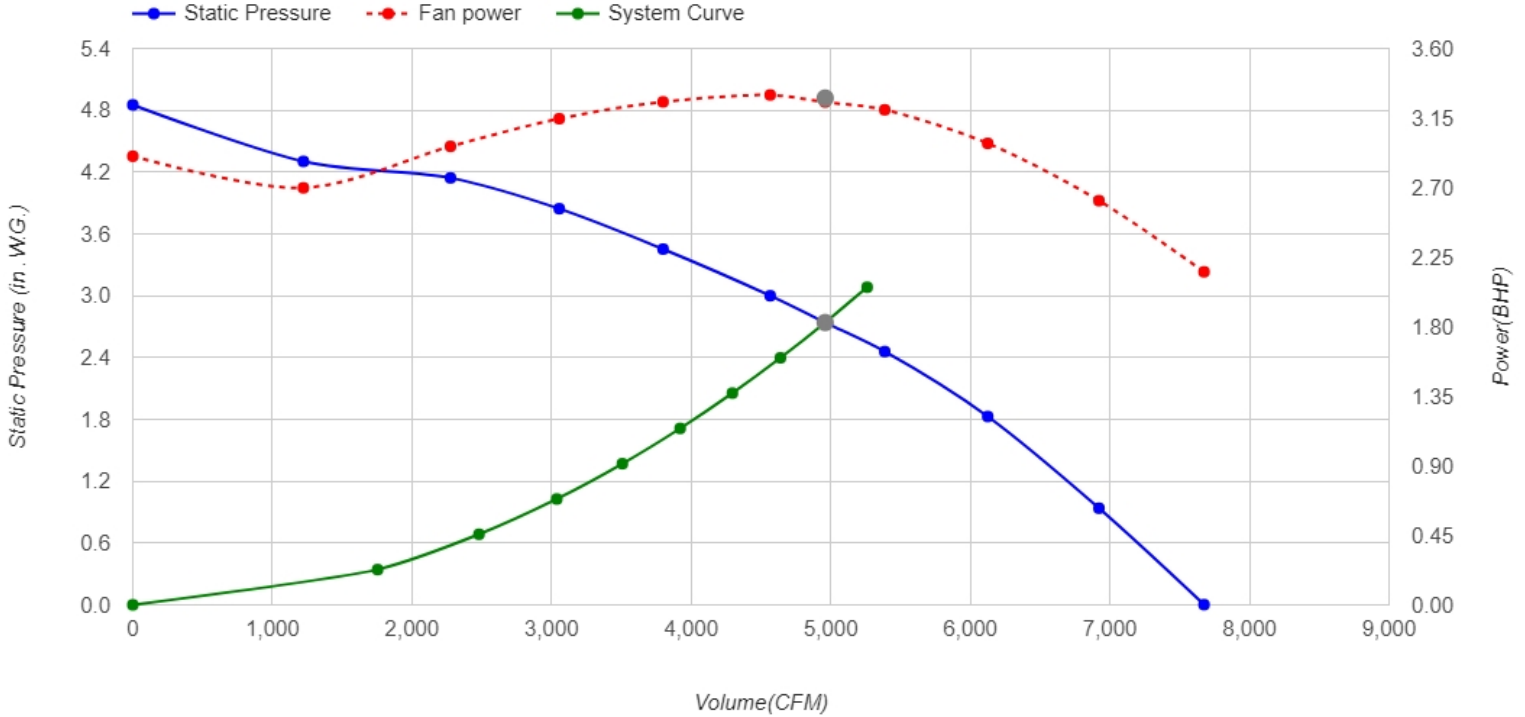
Customer:	0	Fan Tag:	HEF-707A/B
Rep:	CFM Company	Quote :	31182
Job ID:	CSM - EMRF - BLDG	Catalogued	October 2013

Silencer Insertion loss		Project Sound Performance							
Acoustic Windband insertion loss		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Select Silencer Size (Inch)									
Silencer Pressure Drop	in.w.g								
Inlet Sound Power Levels (dBA)		83	88	89	90	87	81	76	69
Outlet Sound Power Levels (dBA)		84	89	91	92	89	82	77	70
Inlet Sound Power levels are not AMCA Certified									



Fan Model: DMF 200

Project: 7-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-707A/B



FEI:1.26

CFM:4960	RPM: 2135	Static Pressure: 2.74 in. W.G	BHP: 3.28
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Sound Data								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	84	89	91	92	89	82	77	70
Sound Pressure Levels 10 ft (A-weighted)	38	53	62	68	68	63	57	49
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	73							

Surrounding Conditions	
Temperature (°F)	70
Altitude (ft.)	5800
Actual Density (lb/ft³)	0.0606
Actual Density (lb/ft³)	0.0606

Other Performance Data	
Tip Speed (ft/min)	13694
Fan Class	Class II
Efficiency (Mech)	67 %
Efficiency (Static)	65 %
Airstream Tem Change	1.93 °F
Wheel Width (%)	100
Outlet Velocity (ft/min)	1228



Plasticair Inc. certifies that the DMF Mixed Flow Fans shown herein are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 210, publication 300, energy efficiency classification 205 and comply with the requirements of the AMCA certified ratings program.

dBa Data is not AMCA International Licensed
 dBA levels are not licensed by AMCA International
 Performance ratings do not include the effects of cross winds.
 Power Ratings (watts, kW, or bhp) does not include transmission losses.
 Performance ratings do not include the effects of appurtenances (accessories)
 The Sound Pressure Levels are based on a fan installation next to (No reflective surface)
 The sound Power level ratings shown are in decibels referred to 10-12 watts, calculated per AMCA International Standard 301
 Values shown are for (Outlet Lwo or Outlet LwoA) Sound Power Levels for: Installation Type C: Ducted Inlet, Free Outlet.
 The Environment for the fan installation effects the measure sound values, therefore the dBA levels cannot be guaranteed. A fans dBA is influenced by nearby sound reflecting surfaces. A-weighted Octave Band Sound Pressure levels (dBA) are not licensed by AMCA Intarnation. Please Consult AMCA publication 303 for more information.

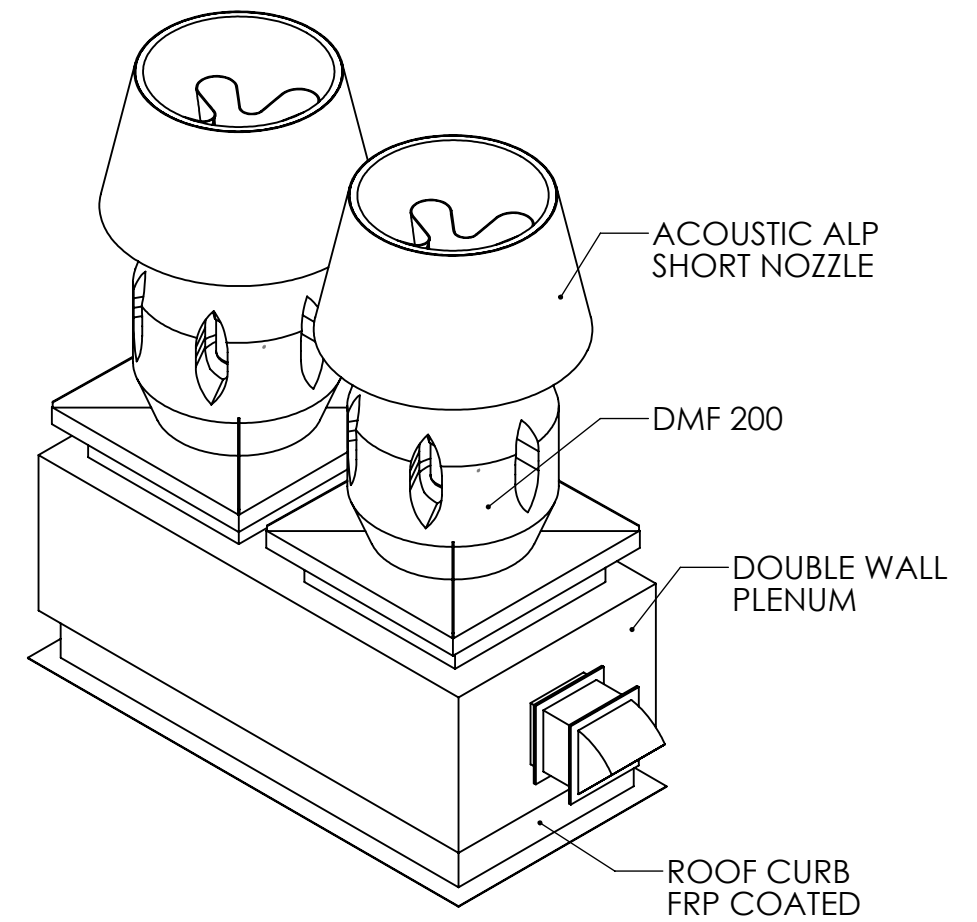
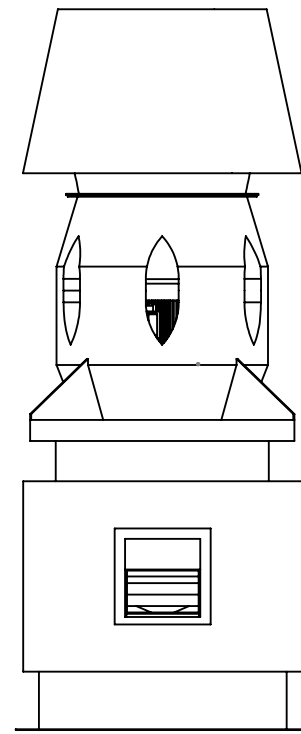
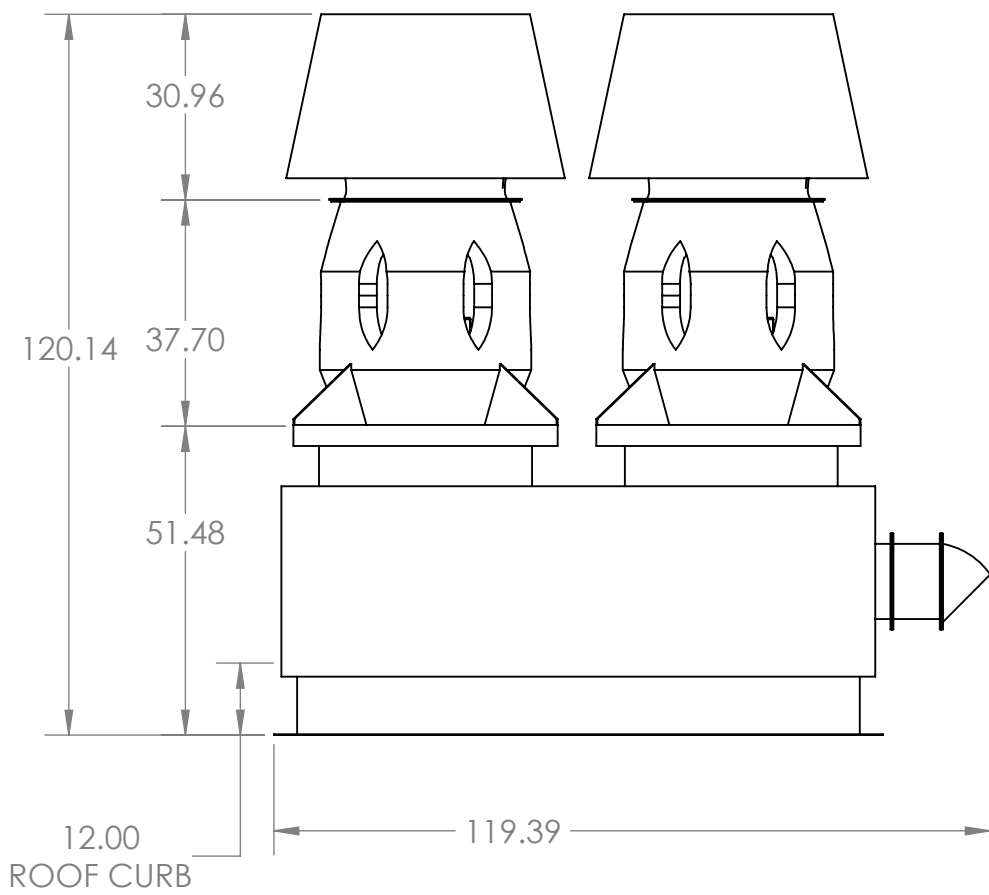
ALP-DMF200- STACK PERFORMANCE DATA

Inlet Volume	4960	CFM
Induced Volume	1984	CFM
Windband Volume	6944	CFM
Dilution Ratio	140	%
Nozzle Velocity	4558	FPM
Windband Velocity	1252	FPM
Stack Pressure Drop	1.19	in.wg.
Effective Plume Rise at Inlet Volume - (Not Including Equipment)		
Plume Height (10 MPH)	18.29	ft
Plume Height (15 MPH)	12.19	ft
Plume Height (20 MPH)	9.15	ft
Effective Stack Height - Includes Equipment Height		
Crosswind	Effective Stack Height	
10 MPH	27.22	ft
15 MPH	21.12	ft
20 MPH	18.08	ft

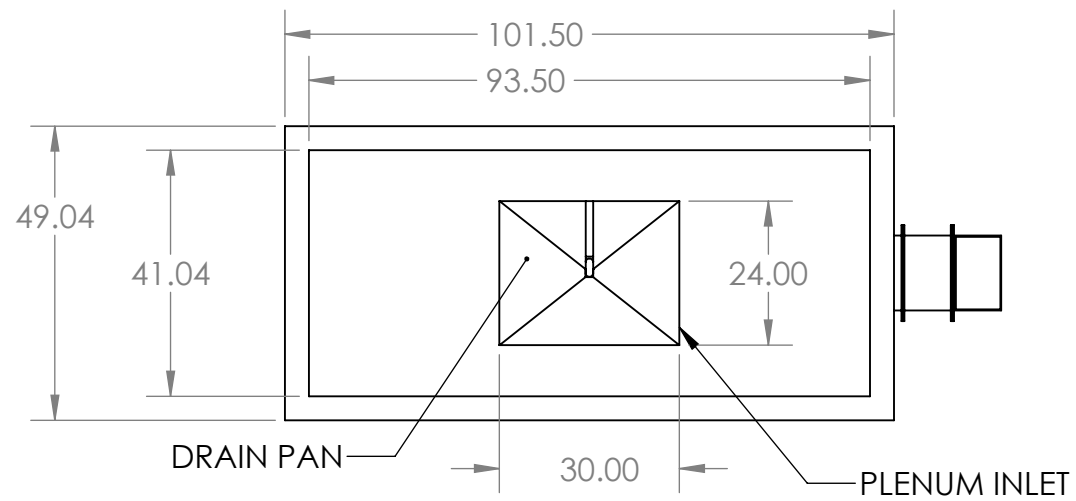
*- Performance ratings do not include the effects of appurtenances (accessories).

*- Power ratings (watts, kW, bhp) does not include transmission losses.

*- Performance ratings do not include the effects of cross winds.



ESTIMATED WEIGHT - 1,825 LBS



UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: 32118-ALP-DMF200	
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/8" ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	DRAWN	C.B.	3/8/2023		
	CHECKED	Y.I.	3/8/2023		
	ENG APPR.				
	MFG APPR.				
INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:		SIZE	DWG. NO.	REV
MATERIAL			B	32118-2	0
NEXT ASSY	USED ON			SCALE: 1:32	SHEET 1 OF 1
APPLICATION		DO NOT SCALE DRAWING			



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4

3

2

1

B

B

A

A



Fan Model: DMF 200

Project: 7-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-707A/B

Wheel Size: 24.5 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 4960 CFM	Fan Power: 3.28 BHP	Altitude: 5800 ft
Inlet Pressure: 2.74 in. W.G	Fan Speed: 2135 RPM	Actual Density: 0.0606 lb/ft ³
Outlet Pressure: 0 in. W.G	Tip Speed: 13694 ft/min	Temperature: 70 °F
Fan E.S.P.: 2.74 in. W.G	Outlet Velocity: 1228 ft/min	

Dimensions Data (inches)

<p>Standard Options</p> <p>All Resin is Epoxy Vinyl Ester (Standard) Exterior is UV stable Interior corrosion resistant barrier with C-Veil All FRP: Rust Proof and UV Stable Housing / Inlet Cone: FRP Direct Drive AMCA Arrangement 4 Motor Protected From the Air Stream Outlet Connection - Flanged not drilled Inlet Connection - Slip Type Fasteners: 316 Stainless Steel Impellar - Mixed Flow (FRP) - Ø 24.5 Wheel Width: 100% Weather Resistant Duct Mounted Vertical Mount</p>	<p>Selected Options</p> <p>Double Wall FRP – Rust Proof construction, 2” insulation completely encapsulated in FRP, UV stable Exterior Fan FRP Construction Insulated FRP double wall construction – Rust proof NEMA 3R disconnect - mounted and wired Damper Actuator - Mounted Bypass dampers - FRP construction Isolation dampers - FRP construction Graphite Lined - Spark Resistant Construction c/w Grounding Kit Double Veil for FRP Dampers Nexus lining 12" High Roof curb - Mild Steel FRP coated Plenum with Side inlet ALP Short nozzle size for 4500 FPM Exit velocity Equipment height restriction above roof surface - 120" including roof curb Required bypass volume 0 CFM Hastelloy C bolts in the fan housing - QTY 5</p>
<p>Motor</p> <p>HP: 5 RPM: 1800 Voltage: 480 Enclosure: TEFC-Prem Efficient Frame: 184TC Hertz: 60 Phase: 3 Notes: Motor to be installed with helwig shaft grounding brush, VFD required by others</p>	



Plasticair

FAN COMPANY



GIF SERIES (BACKWARD INCLINED)



600 SERIES (PROPELLER)



BCMPA SERIES (BACKWARD CURVED)



700 SERIES (PROPELLER)



MINI SERIES (RADIAL & OPTION FOR BACKWARD INCLINED)



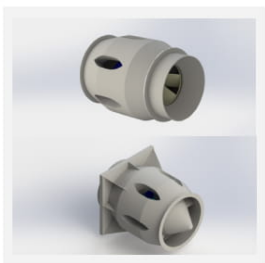
800 SERIES (BACKWARD INCLINED)



HPB SERIES (RADIAL BLADE)



900 SERIES (PROPELLER)



DMF SERIES (MIXED FLOW)





Fan Model: DMF 150

Project: 8-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-708A/B

FAN PERFORMANCE DATA		
Wheel Ø: 18.25 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 2970 CFM	Fan Power: 1.69 BHP	Altitude: 5800 ft
Fan Speed: 2821 RPM	Actual Density: 0.0606 lb/ft ³	Outlet Pressure: 0 in. W.G
Tip Speed: 13480 ft/min	Temperature: 70 °F	Fan E.S.P.: 2.34 in. W.G
Efficiency (Mechanical): 67 %	Efficiency (Static): 65 %	

SOUND DATA								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	76	80	84	87	89	86	77	70
Sound Pressure Levels 10 ft (A-weighted)	30	44	55	63	69	66	58	49
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	72							



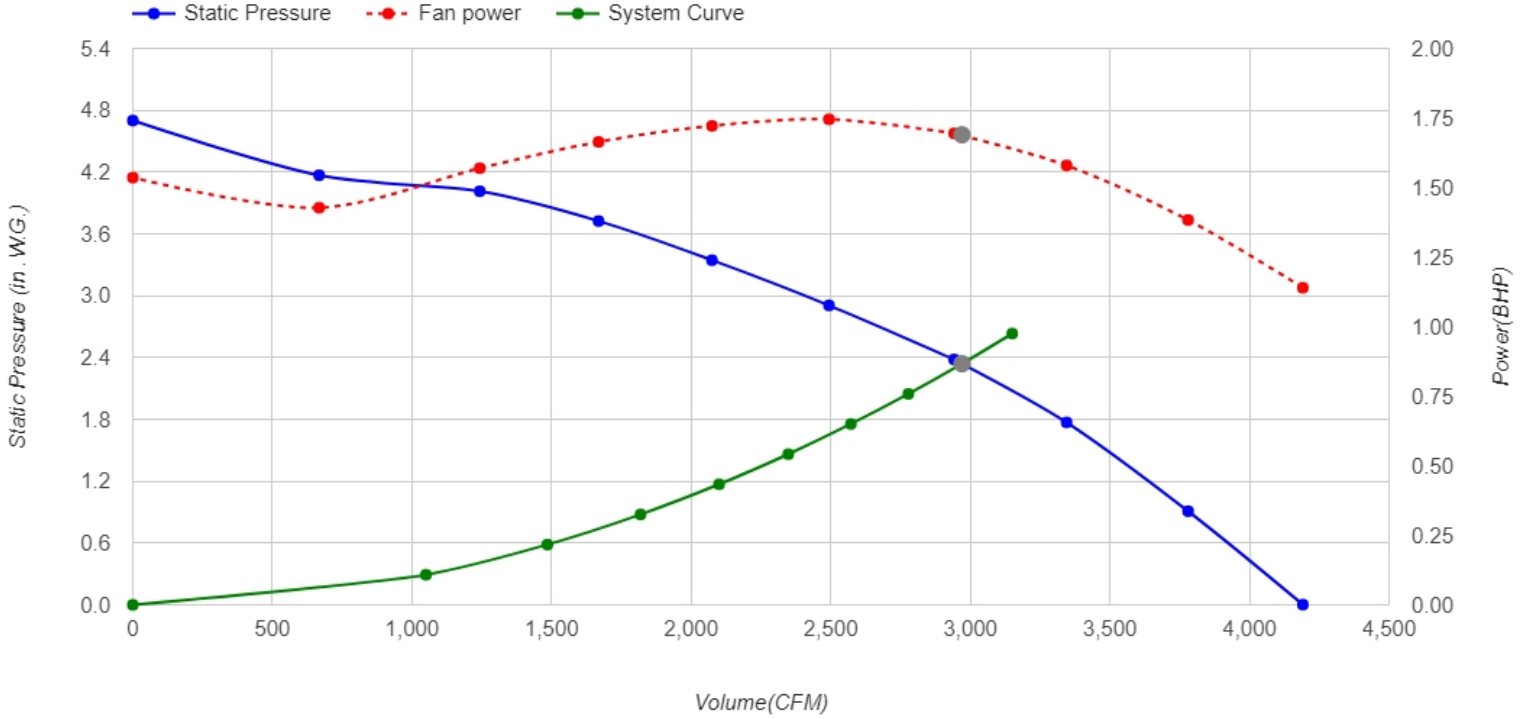
Customer:	0	Fan Tag:	HEF-708A/B
Rep:	CFM Company	Quote :	31182
Job ID:	CSM - EMRF - BLDG	Catalogoued	October 2013

Silencer Insertion loss		Project Sound Performance							
Acoustic Windband insertion loss		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Select Silencer Size (Inch)									
Silencer Pressure Drop	in.w.g								
Inlet Sound Power Levels (dBA)		75	79	82	85	87	85	76	69
Outlet Sound Power Levels (dBA)		76	80	84	87	89	86	77	70
Inlet Sound Power levels are not AMCA Certified									



Fan Model: DMF 150

Project: 8-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-708A/B



FEI:1.34

CFM:2970	RPM: 2821	Static Pressure: 2.34 in. W.G	BHP: 1.69
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Sound Data								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	76	80	84	87	89	86	77	70
Sound Pressure Levels 10 ft (A-weighted)	30	44	55	63	69	66	58	49
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	72							

Surrounding Conditions	
Temperature (°F)	70
Altitude (ft.)	5800
Actual Density (lb/ft ³)	0.0606
Actual Density (lb/ft ³)	0.0606

Other Performance Data	
Tip Speed (ft/min)	13480
Fan Class	Class II
Efficiency (Mech)	67 %
Efficiency (Static)	65 %
Airstream Tem Change	1.66 °F
Wheel Width (%)	100
Outlet Velocity (ft/min)	1320



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ALP-DMF150- STACK PERFORMANCE DATA

Inlet Volume	2970	CFM
Induced Volume	1188	CFM
Windband Volume	4158	CFM
Dilution Ratio	140	%
Nozzle Velocity	4500	FPM
Windband Velocity	1366	FPM
Stack Pressure Drop	1.14	in.wg.
Effective Plume Rise at Inlet Volume - (Not Including Equipment)		
Plume Height (10 MPH)	14.06	ft
Plume Height (15 MPH)	9.38	ft
Plume Height (20 MPH)	7.03	ft
Effective Stack Height - Includes Equipment Height		
Crosswind	Effective Stack Height	
10 MPH	21.86	ft
15 MPH	17.17	ft
20 MPH	14.83	ft

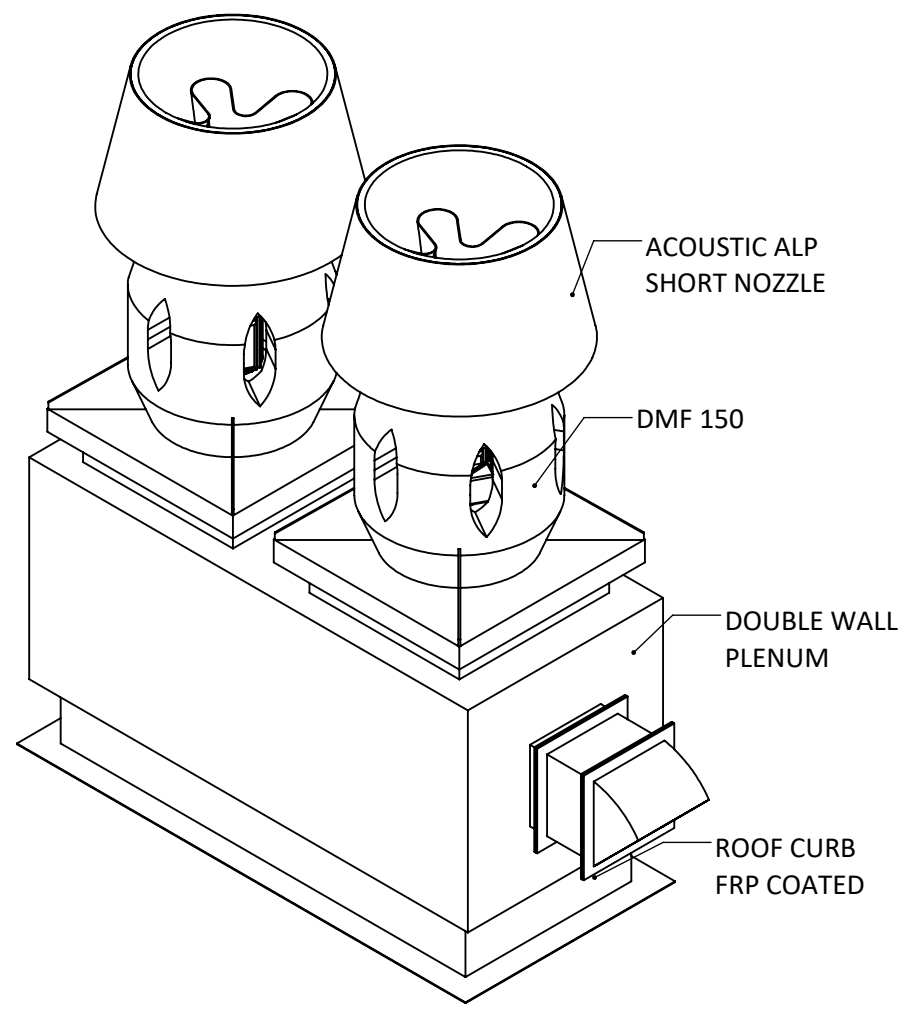
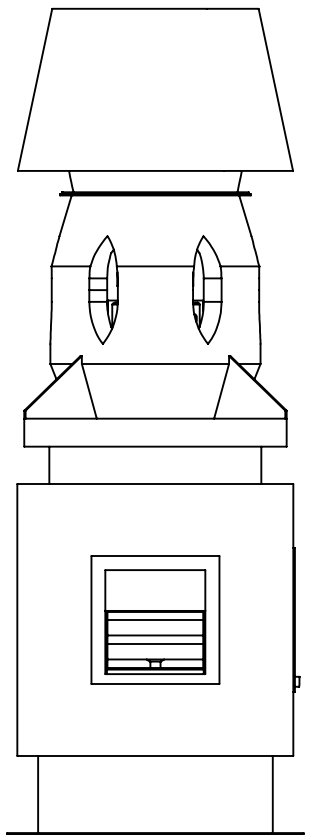
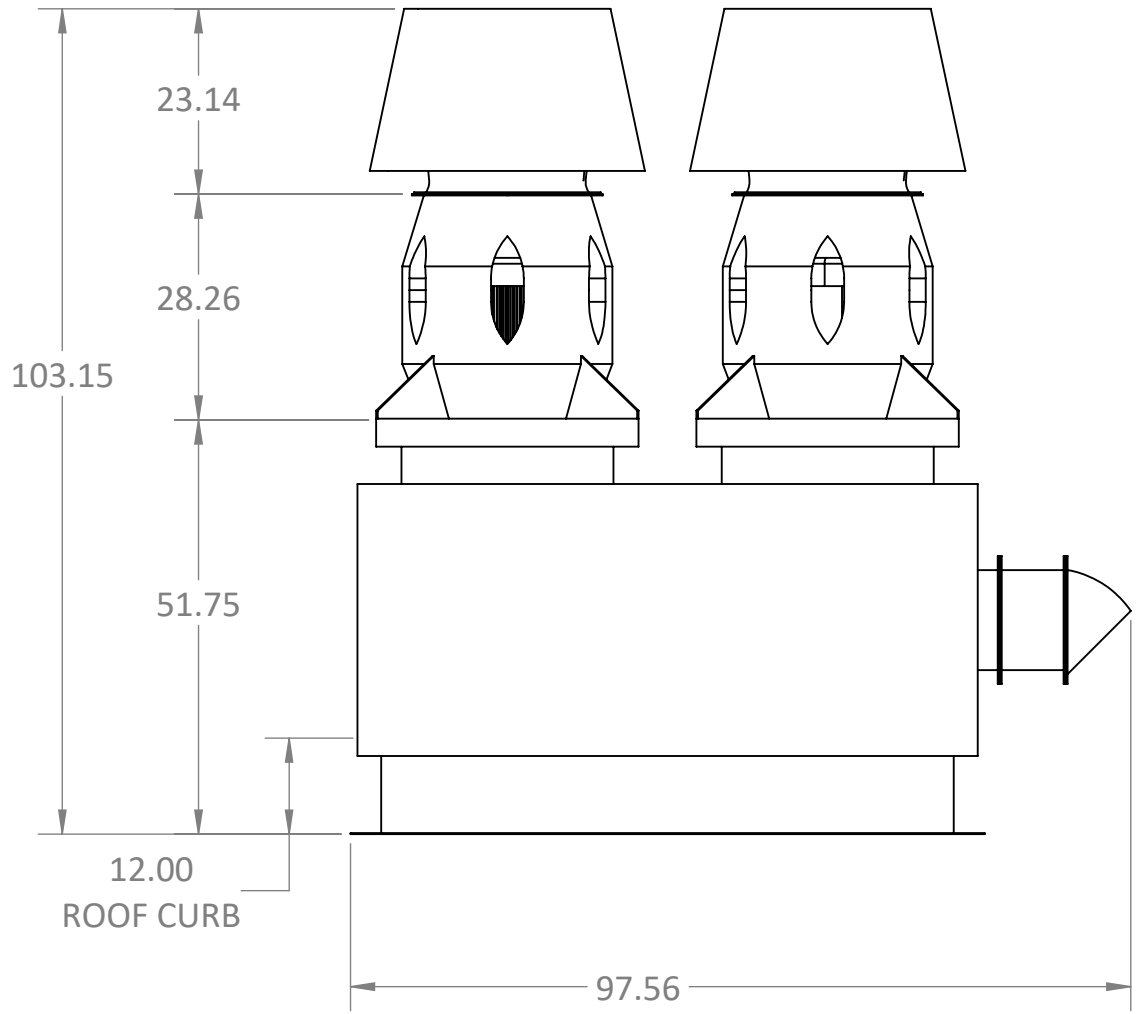
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*- Power ratings (watts, kW, bhp) does not include transmission losses.

*- Performance ratings do not include the effects of cross winds.

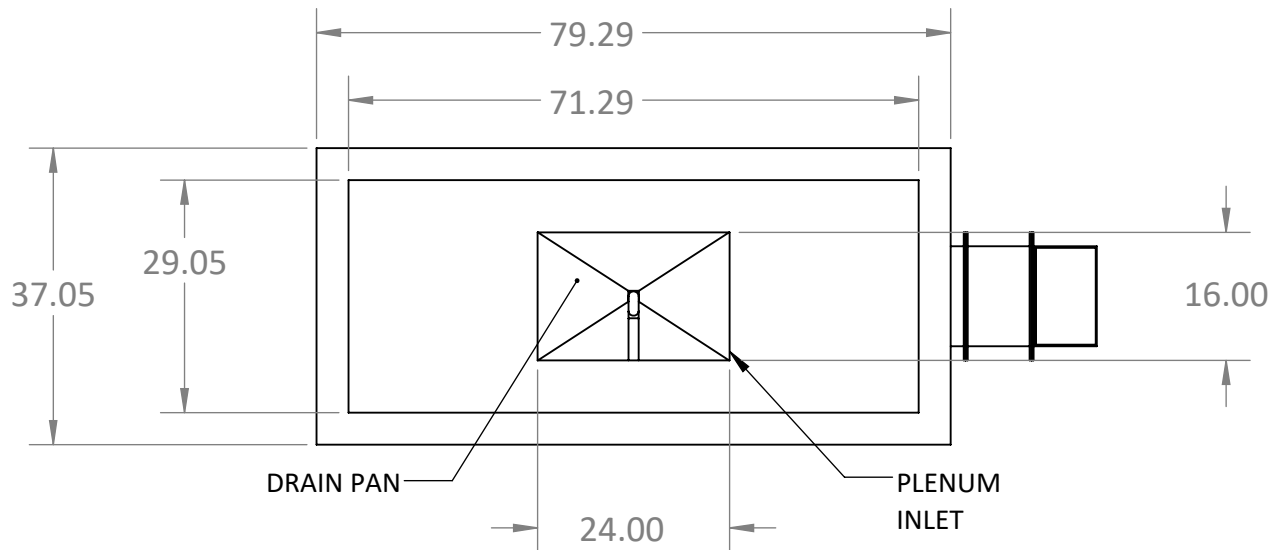
4 3 2 1

B



ESTIMATED WEIGHT - 1,250 LBS

A



DRAIN PAN

PLENUM INLET

24.00

PROPRIETARY AND CONFIDENTIAL

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UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE:	
DIMENSIONS ARE IN INCHES		DRAWN	C.B.	3/8/2023	
TOLERANCES:		CHECKED	Y.I.	3/8/2023	
FRACTIONAL ± 1/8"		ENG APPR.			
ANGULAR: MACH ± BEND ±		MFG APPR.			
TWO PLACE DECIMAL ±					
THREE PLACE DECIMAL ±					
INTERPRET GEOMETRIC TOLERANCING PER:		COMMENTS:		SIZE	DWG. NO.
MATERIAL				B	31182-1
NEXT ASSY	USED ON			SCALE: 1:24	REV
APPLICATION					0
DO NOT SCALE DRAWING				SHEET 1 OF 1	

B

A

4

3

2

1



Fan Model: DMF 150

Project: 8-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-708A/B

Wheel Size: 18.25 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 2970 CFM	Fan Power: 1.69 BHP	Altitude: 5800 ft
Inlet Pressure: 2.34 in. W.G	Fan Speed: 2821 RPM	Actual Density: 0.0606 lb/ft ³
Outlet Pressure: 0 in. W.G	Tip Speed: 13480 ft/min	Temperature: 70 °F
Fan E.S.P.: 2.34 in. W.G	Outlet Velocity: 1320 ft/min	

Dimensions Data (inches)

<p>Standard Options</p> <p>All Resin is Epoxy Vinyl Ester (Standard) Exterior is UV stable Interior corrosion resistant barrier with C-Veil All FRP: Rust Proof and UV Stable Housing / Inlet Cone: FRP Direct Drive AMCA Arrangement 4 Motor Protected From the Air Stream Outlet Connection - Flanged not drilled Inlet Connection - Slip Type Fasteners: 316 Stainless Steel Impellar - Mixed Flow (FRP) - Ø 18.25 Wheel Width: 100% Weather Resistant Duct Mounted Vertical Mount</p>	<p>Selected Options</p> <p>Double Wall FRP – Rust Proof construction, 2" insulation completely encapsulated in FRP, UV stable Exterior Fan FRP Construction Insulated FRP double wall construction – Rust-proof NEMA 3R disconnect - mounted and wired Damper Actuator - Mounted Bypass dampers - FRP construction Isolation dampers - FRP construction Graphite Lined - Spark Resistant Construction c/w Grounding Kit Double Veil for FRP Dampers Nexus lining 12" High Roof curb - Mild Steel FRP coated Plenum with Side inlet ALP Short nozzle size for 4500 FPM Exit velocity Equipment height restriction above roof surface - 120" including roof curb Required bypass volume 2175 CFM Hastelloy C bolts in the fan housing - QTY 5</p>
<p>Motor</p> <p>HP: 3 RPM: 3480 Voltage: 480 Enclosure: TEFC-Prem Efficient Frame: 182TC Hertz: 60 Phase: 3 Notes: Motor to be installed with helwig shaft grounding brush, VFD required by others</p>	

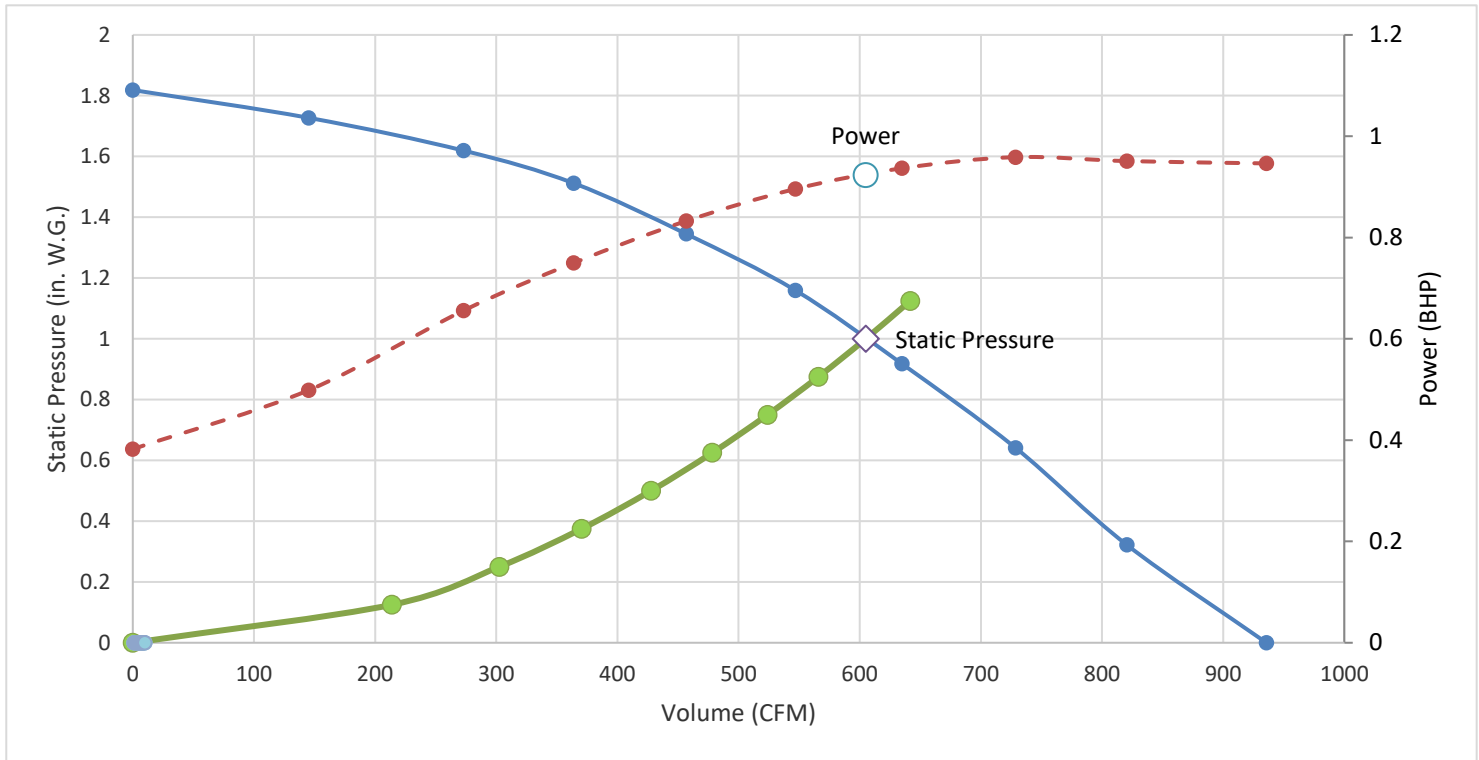


PLASTICAIR FAN PERFORMANCE

31182-2

4-Jan-24

Customer: 0	Fan Tag: PEF-701A/B
Rep: CFM Company	Fan Model: BVS-11
Job ID: USGS - EMRF Perchloric and Radioactive	



CFM	605	RPM:	1652	Static Pressure:	1.00	BHP	0.92
						FEI	1.31

Sound Data:

Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Inlet Sound Power Levels (dB)	89	94	88	83	78	76	74	71
Sound Pressure levels at 5 Feet (A-weighted) *	49	64	65	66	64	63	61	55

Total A-weighted Sound Pressure 5 Feet from Fan (dBA) *	72	Other Performance Data		Surrounding Data	
		Tip Speed (ft/min):	7569	Temperature °F :	70
		Outlet Velocity (ft/min):	3371	Altitude (ft) :	5800
				Density (lb/ft ³) :	0.0606

The environment for the fan installation effects the measured sound values, therefor the dBA levels cannot be guaranteed. A fans dBA is influenced by nearby sound reflecting surfaces. A-weighted Octave Band Sound Pressure levels (dBA) are not licensed by AMCA International. Please consult AMCA publication 303 for more information.

** The airstream temperature change result is a calculated estimation and should not be used for design purposes.

*** The Sound Pressure Levels are based on a fan installation next to No reflective surfaces



Customer:	0	Fan Tag:	PEF-701A/B
Rep:	CFM Company	Quote :	31182-2
Job ID:	USGS - EMRF Perchloric and Radioactive	Catalogued	

Silencer Insertion loss		Project Sound Performance							
Acoustic Windband insertion loss		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Select Silencer Size (Inch)	Silencer Pressure Drop								
	in.w.g								
Inlet Sound Power Levels (dBA)		89	94	88	83	78	76	74	71
Outlet Sound Power Levels (dBA)		90	95	90	85	80	77	75	72
Outlet Sound Power levels are tested as per AMCA Standards									



Plasticair Inc.

Perchloric Acid Exhaust System Selection Program
(Plasticair Model BVS)

1-Jun-23

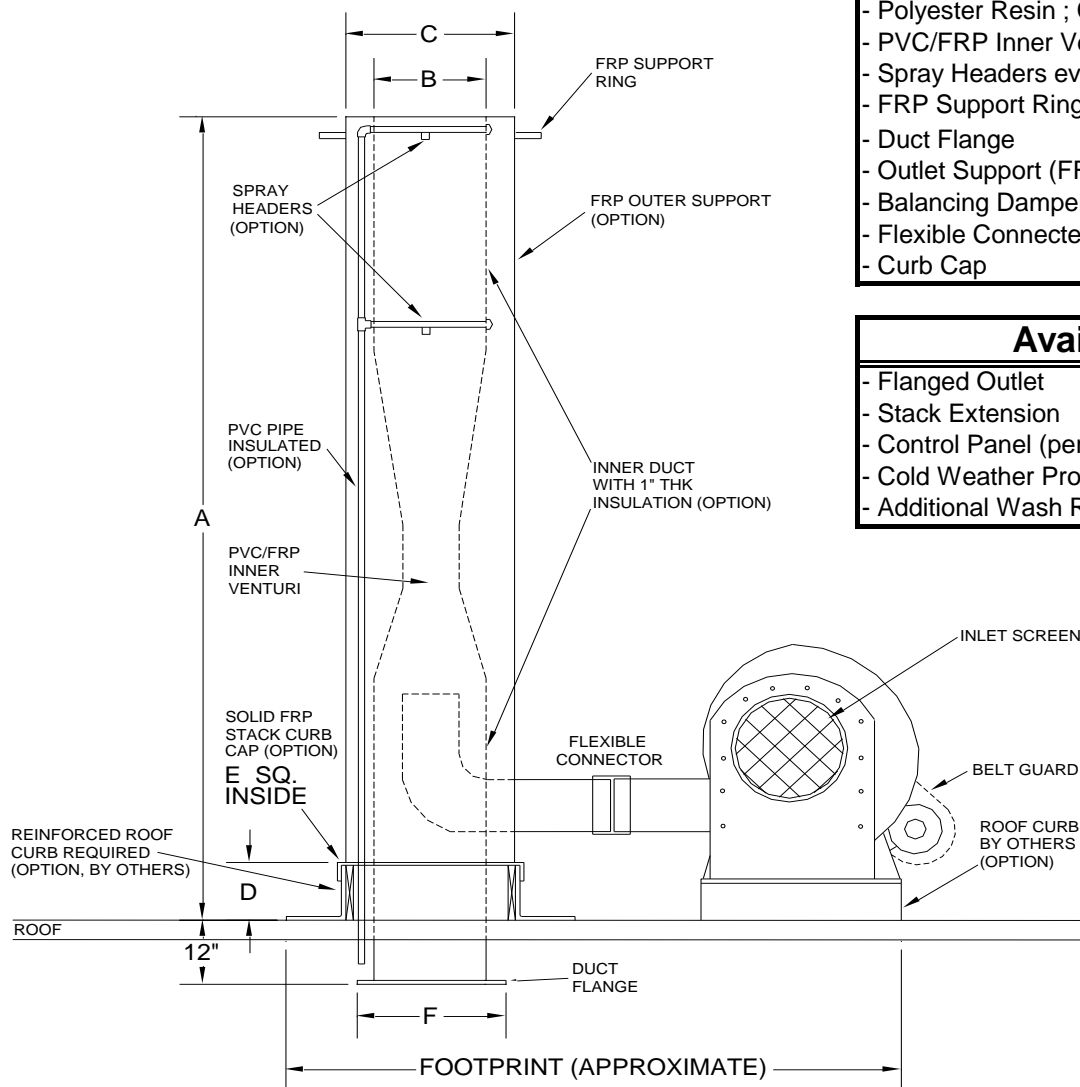
Quote No. : 31182-2		Fan Tag :	PEF-601A/B
Sales Rep : <i>CFM Company</i>		Project Name :	USGS - EMRF Perchloric and Radioactive
System Static Pressure (in. w.g.)	1.00	Selected Model	BVS-11
Induced Air Required (CFM)	605.00		
Fan Motor HP :	2		

Standard Features

- Polyester Resin ; Class 1 Flame Spread
- PVC/FRP Inner Venturi
- Spray Headers every 6 - 10 Feet
- FRP Support Ring
- Duct Flange
- Outlet Support (FRP)
- Balancing Damper
- Flexible Connector (PVC)
- Curb Cap

Available Options

- Flanged Outlet
- Stack Extension
- Control Panel (per spec)
- Cold Weather Protection
- Additional Wash Rings (for Duct)



General Dimensions (Inch)

A	120
B	11
C	16
D	8
E	20
F	15 3/8

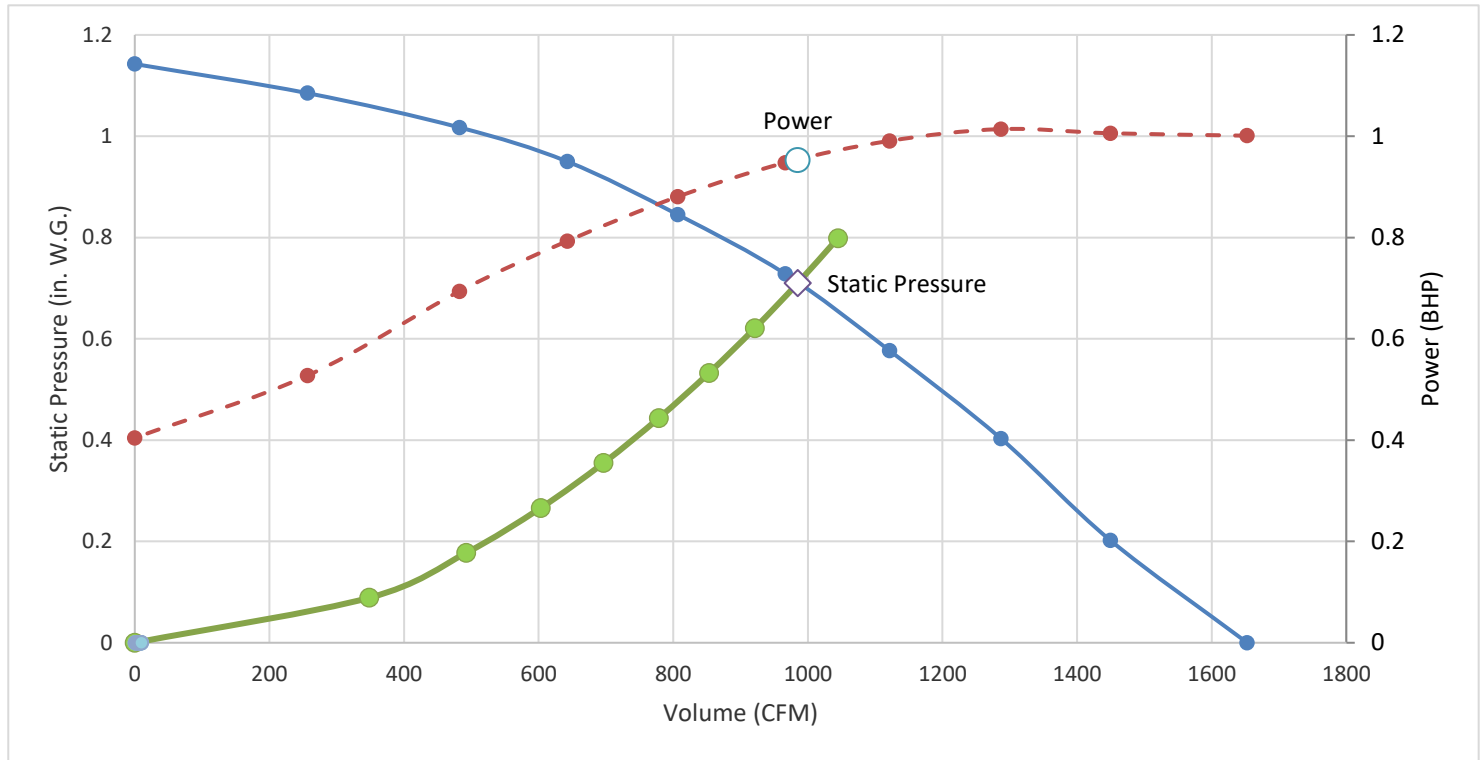


9-Jan-24

BVS PERFORMANCE

31182-2

Customer:	0	Fan Tag:	PEF-601A/B
Rep:	CFM Company	Fan Model:	BVS-12
Job ID:	USGS - EMRF Perchloric and Radioactive		



CFM	985	RPM:	1683	Static Pressure:	0.71	BHP	0.95
						FEI	1.33

Sound Data:

Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Inlet Sound Power Levels (dB)	89	95	89	84	79	77	75	71
Sound Pressure levels at 5 Feet (A-weighted) *	49	65	66	67	64	63	61	56

Total A-weighted Sound Pressure 5 Feet from Fan (dBA) *	73	Other Performance Data		Surrounding Data	
		Tip Speed (ft/min):	7712	Temperature °F :	70
		Outlet Velocity (ft/min):	3191	Altitude (ft) :	5800
				Density (lb/ft^3) :	0.0606

The environment for the fan installation effects the measured sound values, therefor the dBA levels cannot be guaranteed. A fans dBA is influenced by nearby sound reflecting surfaces. A-weighted Octave Band Sound Pressure levels (dBA) are not licensed by AMCA International. Please consult AMCA publication 303 for more information.

** The airstream temperature change result is a calculated estimation and should not be used for design purposes.

*** The Sound Pressure Levels are based on a fan installation next to No reflective surfaces



Customer:	0	Fan Tag:	PEF-601A/B
Rep:	CFM Company	Quote :	31182-2
Job ID:	USGS - EMRF Perchloric and Radioactive	Catalogued	

Select Silencer Size (Inch)	Silencer Pressure Drop	in.w.g	Project Sound Performance							
			63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Inlet Sound Power Levels (dBA)			89	95	89	84	79	77	75	71
Outlet Sound Power Levels (dBA)			90	96	91	86	81	78	76	72
Outlet Sound Power levels are tested as per AMCA Standards										



Plasticair Inc.

Perchloric Acid Exhaust System Selection Program
(Plasticair Model BVS)

9-Jan-24

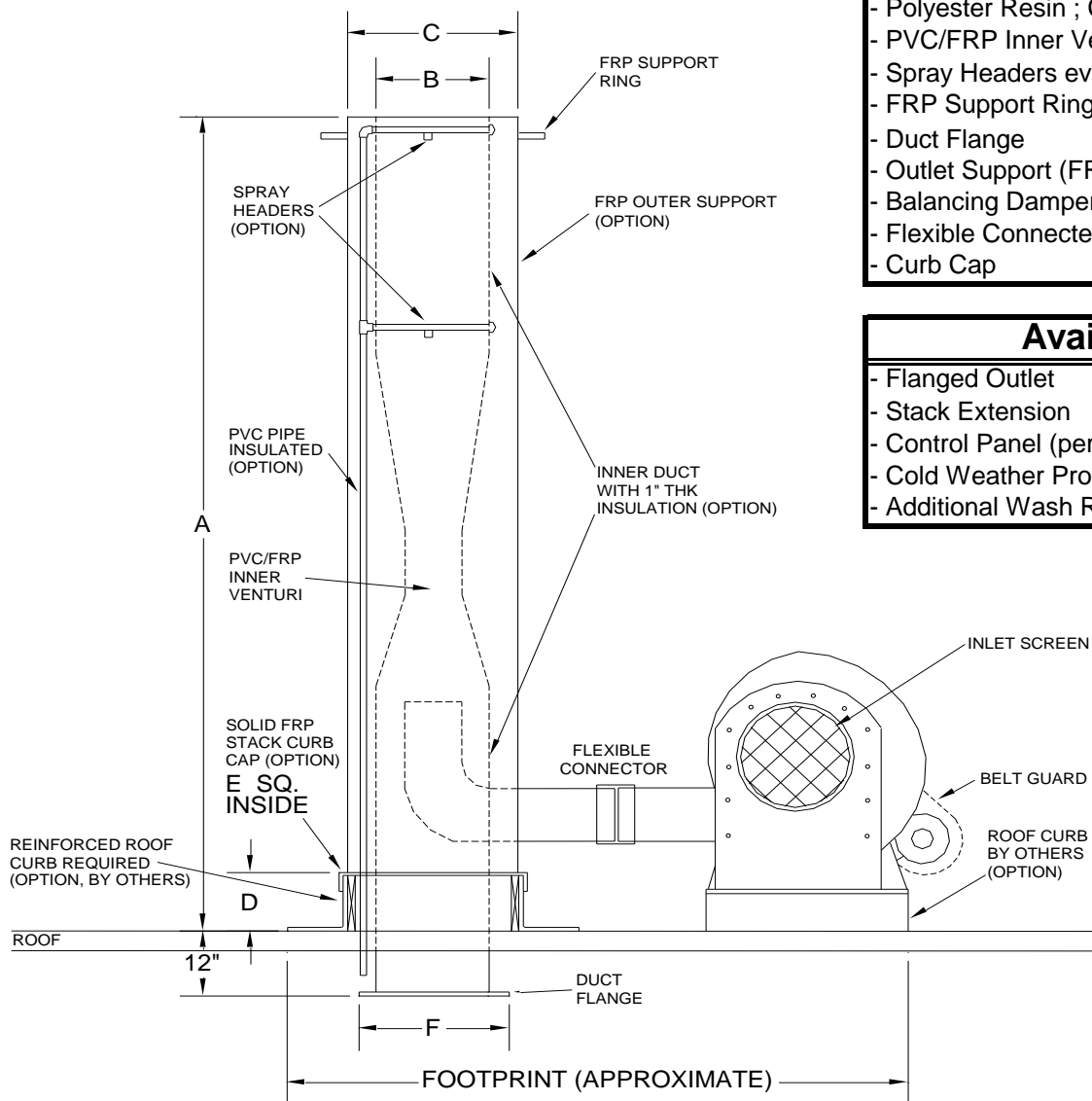
Quote No. : 31182-2		Fan Tag : PEF-601A/B
Sales Rep : <i>CFM Company</i>		Project Name : USGS - EMRF Perchloric and Radioactive
System Static Pressure (in. w.g.)	0.71	Selected Model
Induced Air Required (CFM)	985.00	
Fan Motor HP :	2	BVS-12

Standard Features

- Polyester Resin ; Class 1 Flame Spread
- PVC/FRP Inner Venturi
- Spray Headers every 6 - 10 Feet
- FRP Support Ring
- Duct Flange
- Outlet Support (FRP)
- Balancing Damper
- Flexible Connector (PVC)
- Curb Cap

Available Options

- Flanged Outlet
- Stack Extension
- Control Panel (per spec)
- Cold Weather Protection
- Additional Wash Rings (for Duct)



General Dimensions (Inch)

A	120
B	12
C	17
D	10
E	21
F	16 3/8



Plasticair

FAN COMPANY



GIF SERIES (BACKWARD INCLINED)



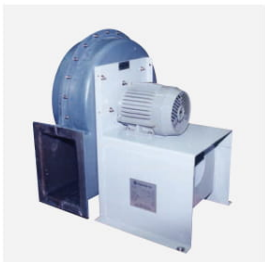
600 SERIES (PROPELLER)



BCMPA SERIES (BACKWARD CURVED)



700 SERIES (PROPELLER)



MINI SERIES (RADIAL & OPTION FOR BACKWARD INCLINED)



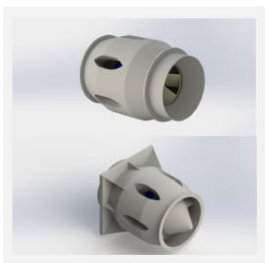
800 SERIES (BACKWARD INCLINED)



HPB SERIES (RADIAL BLADE)



900 SERIES (PROPELLER)



DMF SERIES (MIXED FLOW)





Fan Model: DMF 150

Project: 11-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-711A/B

FAN PERFORMANCE DATA		
Wheel Ø: 18.25 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 2970 CFM	Fan Power: 1.79 BHP	Altitude: 5800 ft
Fan Speed: 2869 RPM	Actual Density: 0.0606 lb/ft ³	Outlet Pressure: 0 in. W.G
Tip Speed: 13709 ft/min	Temperature: 70 °F	Fan E.S.P.: 2.49 in. W.G
Efficiency (Mechanical): 67 %	Efficiency (Static): 65 %	

SOUND DATA								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	77	80	84	87	89	86	78	71
Sound Pressure Levels 10 ft (A-weighted)	31	44	55	63	69	67	58	49
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	72							



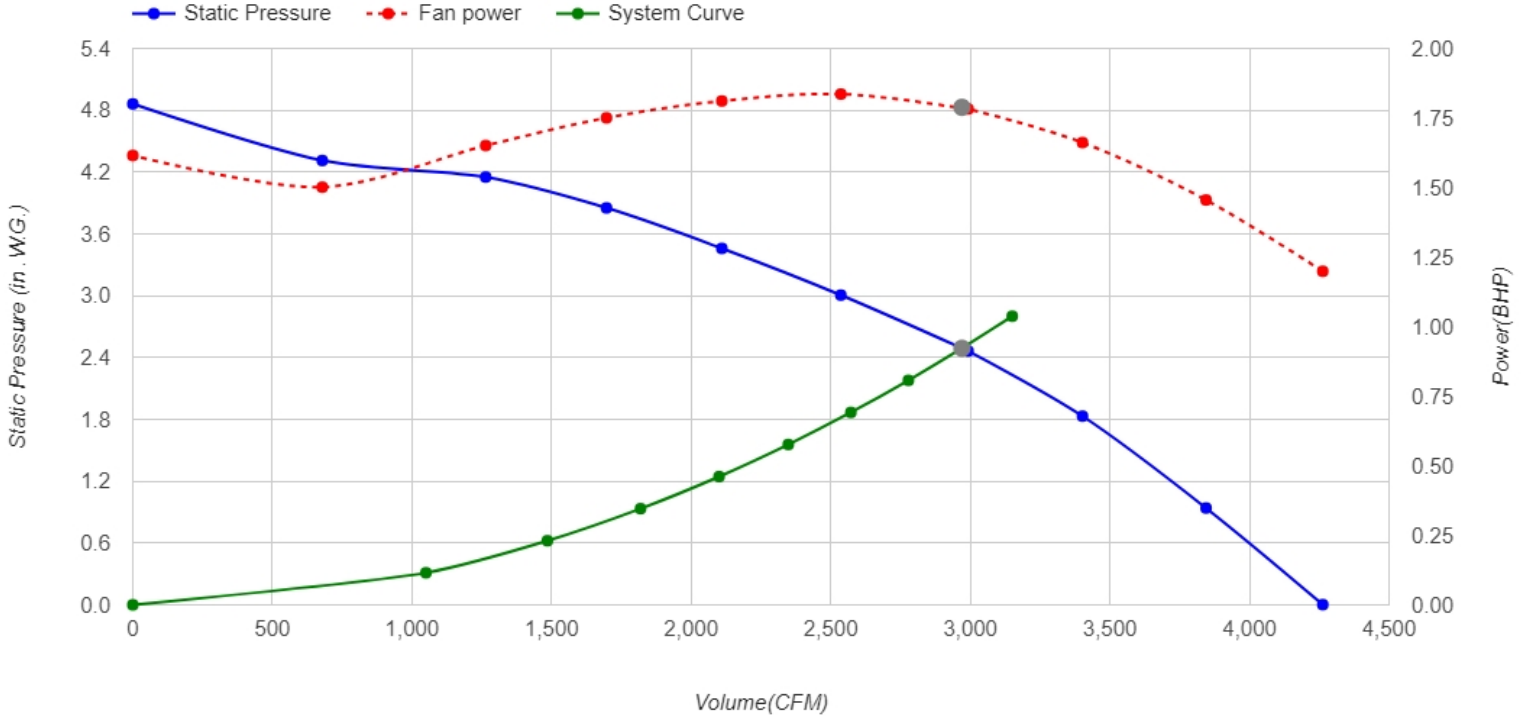
Customer:	0	Fan Tag:	HEF-711A/B
Rep:	CFM Company	Quote :	31182
Job ID:	CSM - EMRF - BLDG	Catalogued	October 2013

Silencer Insertion loss		Project Sound Performance							
Acoustic Windband insertion loss		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Select Silencer Size (Inch)									
Silencer Pressure Drop	in.w.g								
Inlet Sound Power Levels (dBA)		76	79	82	85	87	85	77	70
Outlet Sound Power Levels (dBA)		77	80	84	87	89	86	78	71
Inlet Sound Power levels are not AMCA Certified									



Fan Model: DMF 150

Project: 11-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-711A/B



FEI:1.33

CFM:2970	RPM: 2869	Static Pressure: 2.49 in. W.G	BHP: 1.79
----------	-----------	-------------------------------	-----------

Sound Data								
Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Outlet Sound Power Levels (dB)	77	80	84	87	89	86	78	71
Sound Pressure Levels 10 ft (A-weighted)	31	44	55	63	69	67	58	49
Total A Weighted Sound Pressure @ 10 ft from fan (dBA)	72							

Surrounding Conditions	
Temperature (°F)	70
Altitude (ft.)	5800
Actual Density (lb/ft³)	0.0606
Actual Density (lb/ft³)	0.0606

Other Performance Data	
Tip Speed (ft/min)	13709
Fan Class	Class II
Efficiency (Mech)	67 %
Efficiency (Static)	65 %
Airstream Tem Change	1.76 °F
Wheel Width (%)	100
Outlet Velocity (ft/min)	1320



Plasticair Inc. certifies that the DMF Mixed Flow Fans shown herein are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 210, publication 300, energy efficiency classification 205 and comply with the requirements of the AMCA certified ratings program.

dBa Data is not AMCA International Licensed
 dBA levels are not licensed by AMCA International
 Performance ratings do not include the effects of cross winds.
 Power Ratings (watts, kW, or bhp) does not include transmission losses.
 Performance ratings do not include the effects of appurtenances (accessories)
 The Sound Pressure Levels are based on a fan installation next to (No reflective surface)
 The sound Power level ratings shown are in decibels referred to 10-12 watts, calculated per AMCA International Standard 301
 Values shown are for (Outlet Lwo or Outlet LwoA) Sound Power Levels for: Installation Type C: Ducted Inlet, Free Outlet.
 The Environment for the fan installation effects the measure sound values, therefore the dBA levels cannot be guaranteed. A fans dBA is influenced by nearby sound reflecting surfaces. A-weighted Octave Band Sound Pressure levels (dBA) are not licensed by AMCA Intarnation. Please Consult AMCA publication 303 for more information.

ALP-DMF150- STACK PERFORMANCE DATA

Inlet Volume	2970	CFM
Induced Volume	1188	CFM
Windband Volume	4158	CFM
Dilution Ratio	140	%
Nozzle Velocity	4500	FPM
Windband Velocity	1366	FPM
Stack Pressure Drop	1.14	in.wg.
Effective Plume Rise at Inlet Volume - (Not Including Equipment)		
Plume Height (10 MPH)	14.06	ft
Plume Height (15 MPH)	9.38	ft
Plume Height (20 MPH)	7.03	ft
Effective Stack Height - Includes Equipment Height		
Crosswind	Effective Stack Height	
10 MPH	21.86	ft
15 MPH	17.17	ft
20 MPH	14.83	ft

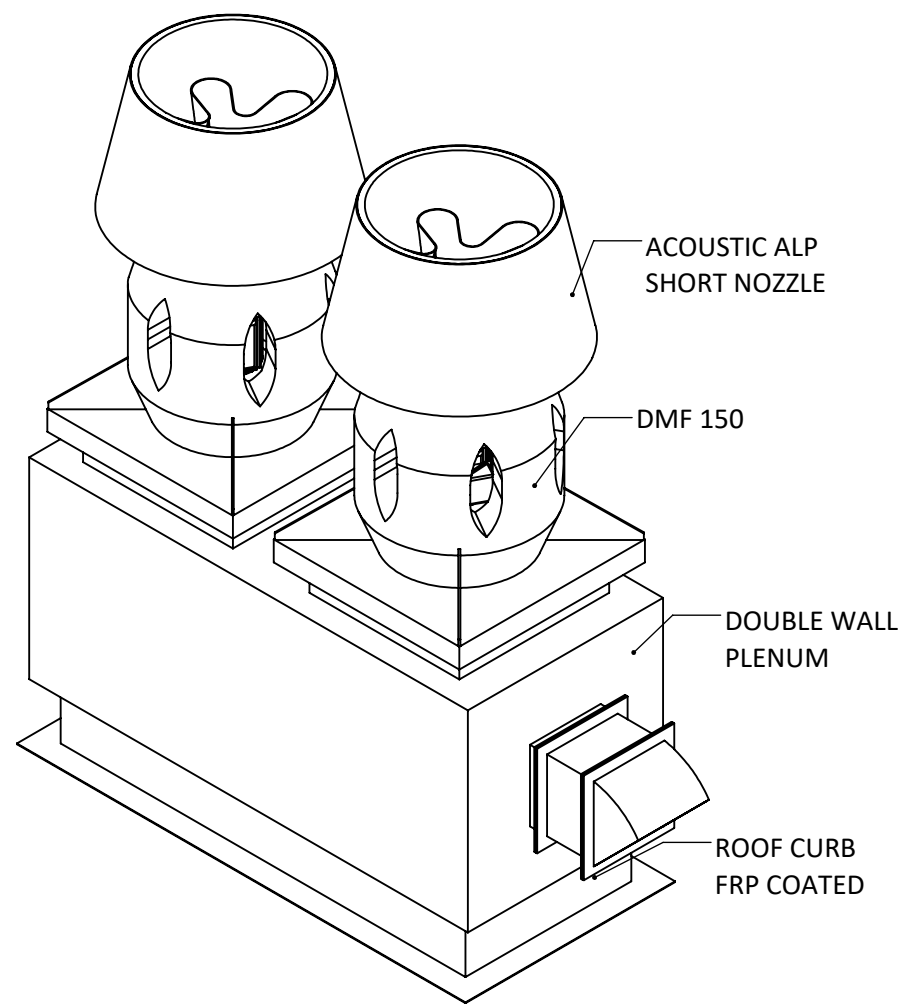
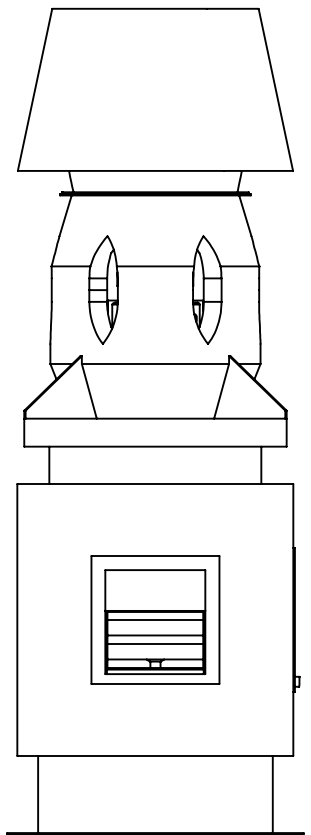
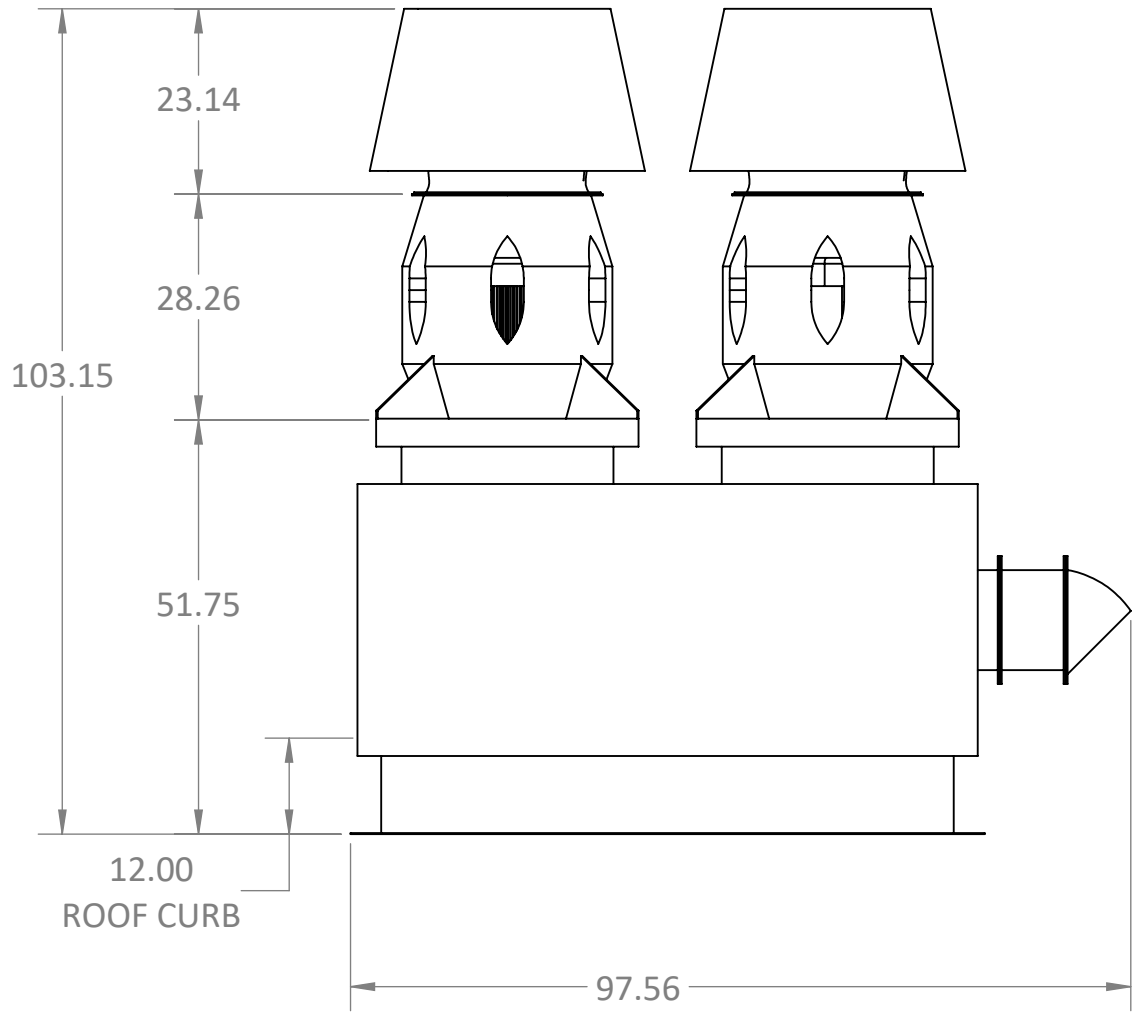
*- Performance ratings do not include the effects of appurtenances (accessories).

*- Power ratings (watts, kW, bhp) does not include transmission losses.

*- Performance ratings do not include the effects of cross winds.

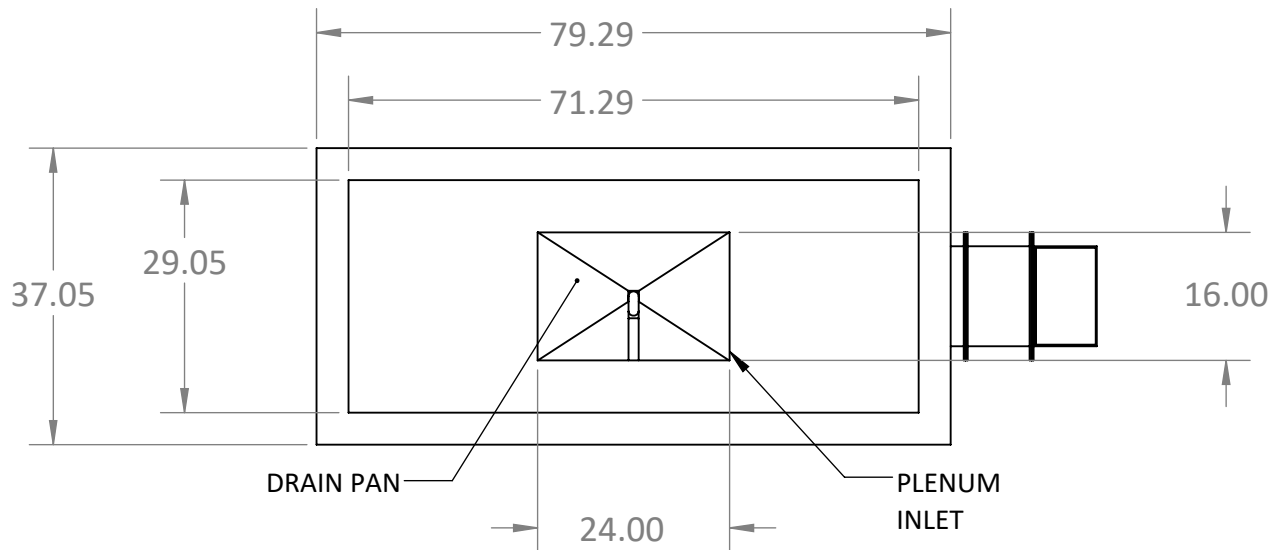
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B



ESTIMATED WEIGHT - 1,250 LBS

A



UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: 31182-ALP-DMF150	
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/8" ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	DRAWN	C.B.	3/8/2023		
	CHECKED	Y.I.	3/8/2023		
	ENG APPR.				
	MFG APPR.				
INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:		SIZE	DWG. NO.	REV
MATERIAL			B	31182-1	0
NEXT ASSY	USED ON			SCALE: 1:24	SHEET 1 OF 1
APPLICATION		DO NOT SCALE DRAWING			



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NEXT ASSY	USED ON
APPLICATION	

4 3 2 1



Fan Model: DMF 150

Project: 11-31182-CSM - EMRF - BLDG	Project Location:
Contractor:	Engineer Location:
Plasticair Sales Rep: CFM Company	Fan Tag: HEF-711A/B

Wheel Size: 18.25 inches	Wheel Width: 100 %	AMCA Drive Arrangement #: AMCA Arr. 4
Total Volume: 2970 CFM	Fan Power: 1.79 BHP	Altitude: 5800 ft
Inlet Pressure: 2.49 in. W.G	Fan Speed: 2869 RPM	Actual Density: 0.0606 lb/ft ³
Outlet Pressure: 0 in. W.G	Tip Speed: 13709 ft/min	Temperature: 70 °F
Fan E.S.P.: 2.49 in. W.G	Outlet Velocity: 1320 ft/min	

Dimensions Data (inches)

<p>Standard Options</p> <p>All Resin is Epoxy Vinyl Ester (Standard) Exterior is UV stable Interior corrosion resistant barrier with C-Veil All FRP: Rust Proof and UV Stable Housing / Inlet Cone: FRP Direct Drive AMCA Arrangement 4 Motor Protected From the Air Stream Outlet Connection - Flanged not drilled Inlet Connection - Slip Type Fasteners: 316 Stainless Steel Impellar - Mixed Flow (FRP) - Ø 18.25 Wheel Width: 100% Weather Resistant Duct Mounted Vertical Mount</p>	<p>Selected Options</p> <p>Double Wall FRP – Rust Proof construction, 2" insulation completely encapsulated in FRP, UV stable Exterior Fan FRP Construction Insulated FRP double wall construction – Rust-proof NEMA 3R disconnect - mounted and wired Damper Actuator - Mounted Bypass dampers - FRP construction Isolation dampers - FRP construction Graphite Lined - Spark Resistant Construction c/w Grounding Kit Double Veil for FRP Dampers Nexus lining 12" High Roof curb - Mild Steel FRP coated Plenum with Side inlet ALP Short nozzle size for 4500 FPM Exit velocity Equipment height restriction above roof surface - 120" including roof curb Required bypass volume 2220 CFM Hastelloy C bolts in the fan housing - QTY 5</p>
<p>Motor</p> <p>HP: 3 RPM: 3480 Voltage: 480 Enclosure: TEFC-Prem Efficient Frame: 182TC Hertz: 60 Phase: 3 Notes: Motor to be installed with helwig shaft grounding brush, VFD required by others</p>	

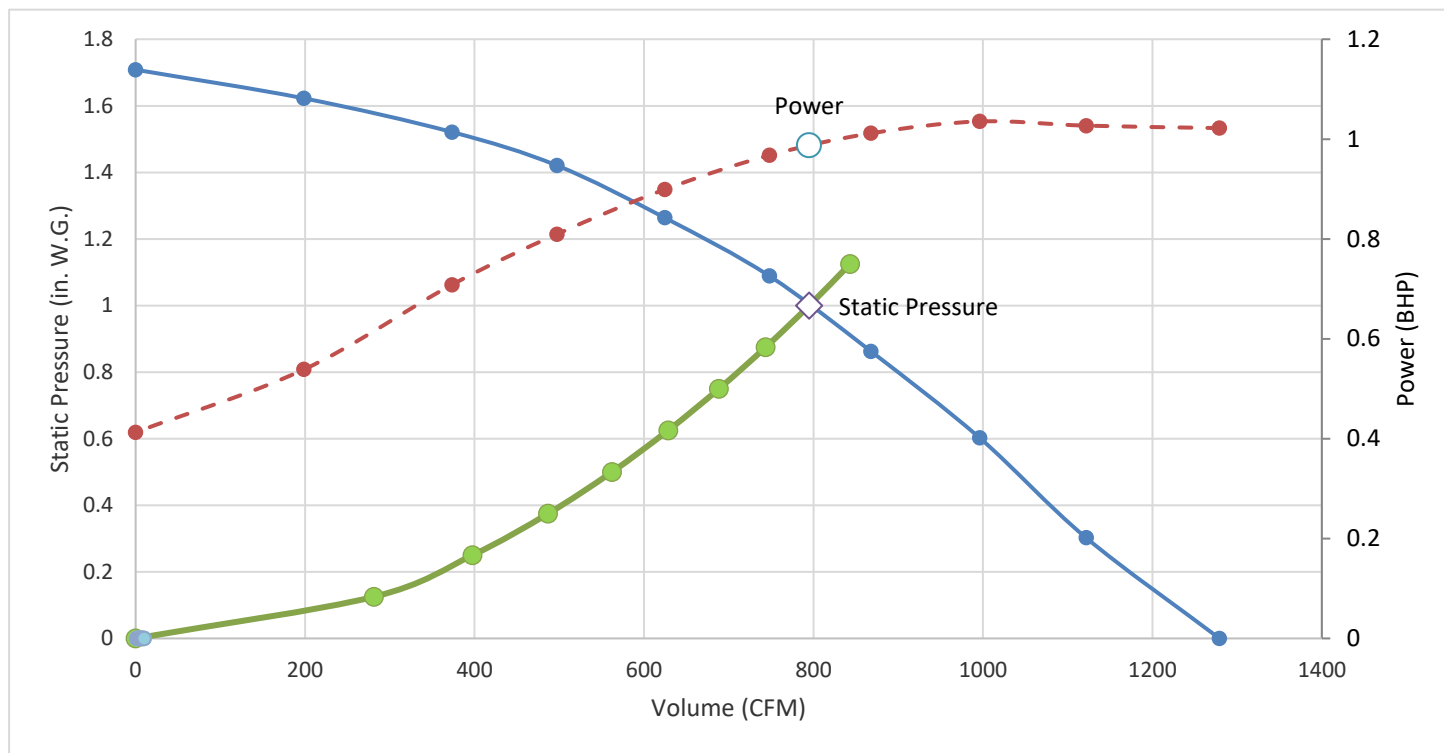


9-Jan-24

BVS PERFORMANCE

31182-2

Customer:	0	Fan Tag:	PEF-702A/B
Rep:	CFM Company	Fan Model:	BVS-12
Job ID:	USGS - EMRF Perchloric and Radioactive		



CFM	795	RPM:	1695	Static Pressure:	1.00	BHP	0.99
						FEI	1.31

Sound Data:

Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Inlet Sound Power Levels (dB)	89	95	89	84	79	77	75	72
Sound Pressure levels at 5 Feet (A-weighted) *	49	65	66	67	64	64	62	56

Total A-weighted Sound Pressure 5 Feet from Fan (dBA) *	73	Other Performance Data			Surrounding Data	
		Tip Speed (ft/min):		7766	Temperature °F :	70
		Outlet Velocity (ft/min):		3046	Altitude (ft) :	5800
				Density (lb/ft ³) :	0.0606	

The environment for the fan installation effects the measured sound values, therefor the dBA levels cannot be guaranteed. A fans dBA is influenced by nearby sound reflecting surfaces. A-weighted Octave Band Sound Pressure levels (dBA) are not licensed by AMCA International. Please consult AMCA publication 303 for more information.

** The airstream temperature change result is a calculated estimation and should not be used for design purposes.

*** The Sound Pressure Levels are based on a fan installation next to No reflective surfaces



Customer:	0	Fan Tag:	PEF-702A/B
Rep:	CFM Company	Quote :	31182-2
Job ID:	USGS - EMRF Perchloric and Radioactive	Catalogoued	

Silencer Insertion loss		Project Sound Performance							
Acoustic Windband insertion loss		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Select Silencer Size (Inch)									
Silencer Pressure Drop	in.w.g								
Inlet Sound Power Levels (dBA)		89	95	89	84	79	77	75	72
Outlet Sound Power Levels (dBA)		90	96	91	86	81	78	76	73
Outlet Sound Power levels are tested as per AMCA Standards									



Plasticair Inc.

Perchloric Acid Exhaust System Selection Program

(Plasticair Model BVS)

9-Jan-24

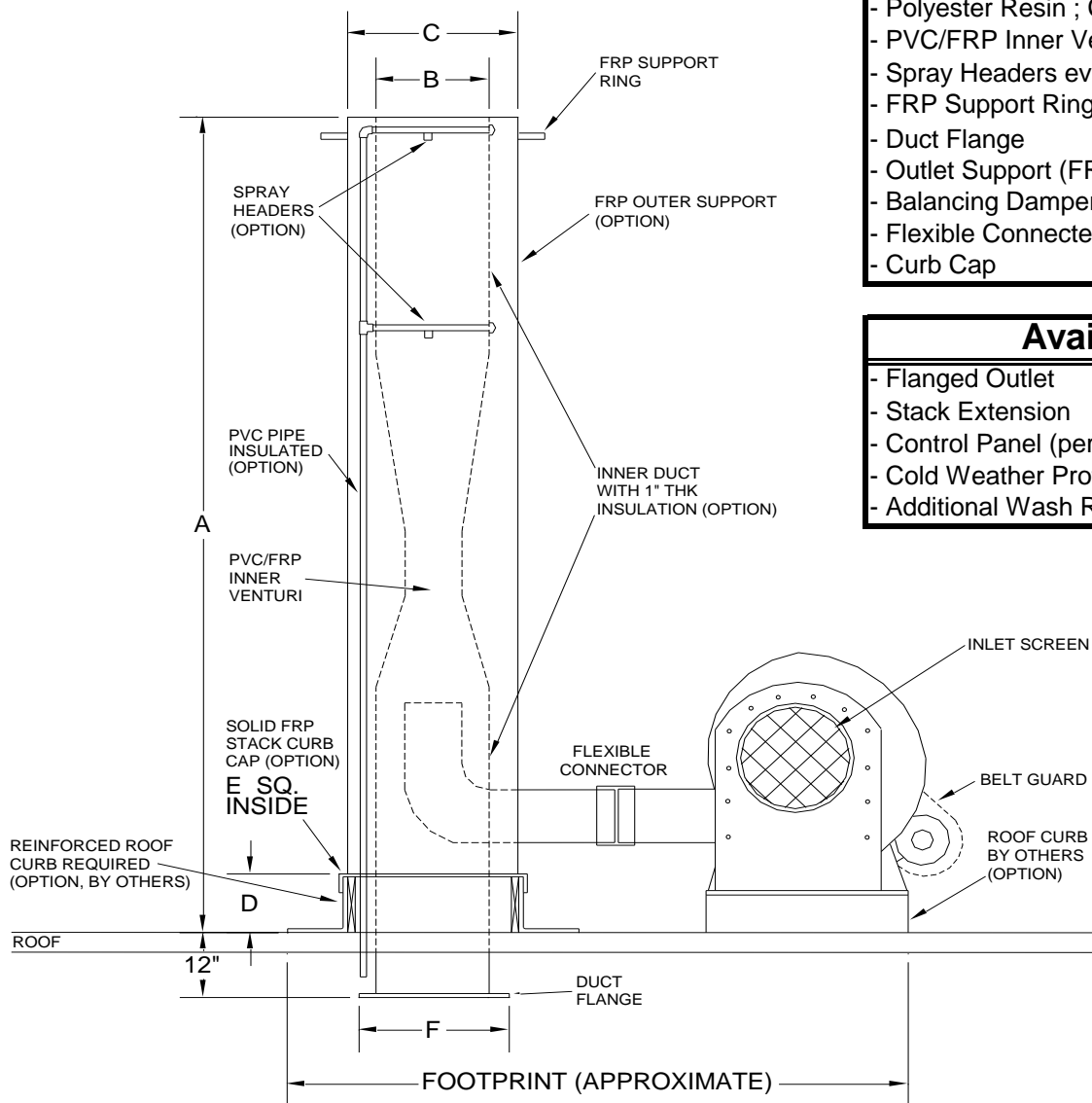
Quote No. : 31182-2		Fan Tag : PEF-702A/B
Sales Rep : <i>CFM Company</i>		Project Name : USGS - EMRF Perchloric and Radioactive
System Static Pressure (in. w.g.)	1.00	Selected Model
Induced Air Required (CFM)	795.00	
Fan Motor HP :	2	BVS-12

Standard Features

- Polyester Resin ; Class 1 Flame Spread
- PVC/FRP Inner Venturi
- Spray Headers every 6 - 10 Feet
- FRP Support Ring
- Duct Flange
- Outlet Support (FRP)
- Balancing Damper
- Flexible Connector (PVC)
- Curb Cap

Available Options

- Flanged Outlet
- Stack Extension
- Control Panel (per spec)
- Cold Weather Protection
- Additional Wash Rings (for Duct)



General Dimensions (Inch)

A	120
B	12
C	17
D	10
E	21
F	16 3/8

4

3

2

1

PERFORMANCE: 985CFM AT 0.71" W.G.

TAG(S): PEF-601A/B
MODEL AND QTY: BVS-12 with 2xBCMPA-16 FANS (1 REDUNDANT)

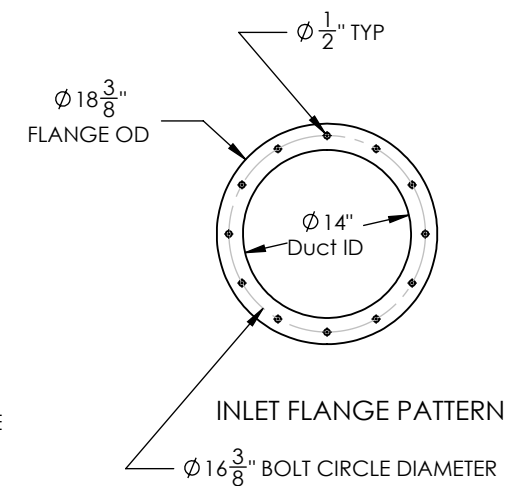
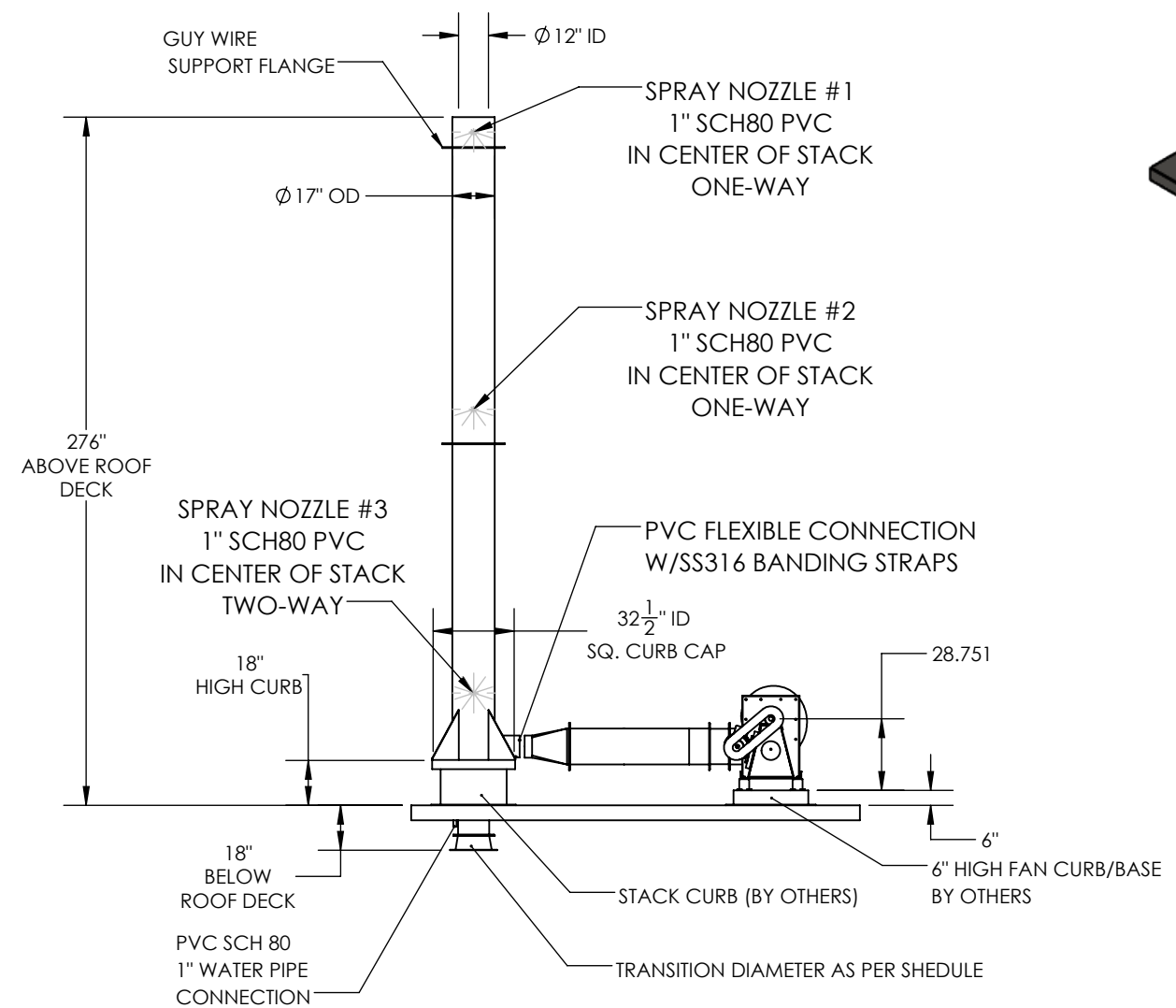
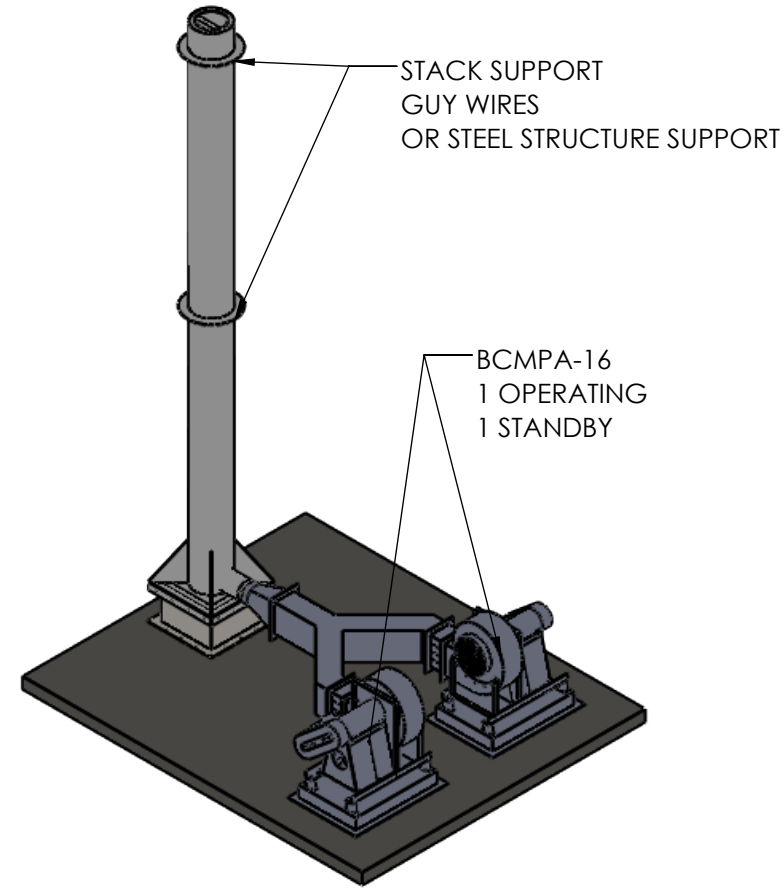
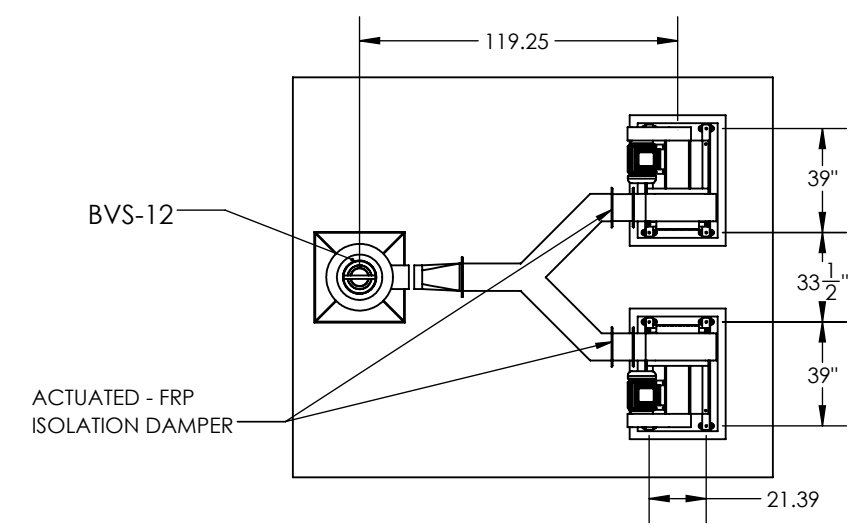
FANS:
CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZERS
SPARK-RESISTANT CONSTRUCTION: NO
ARRANGEMENT: #9
FAN INLET SAFETY SCREEN: 304 SS
VFD: NOT INCLUDED
ACCESS DOOR: BOLTED
FAN DRAIN: YES
DISCONNECT: NEMA 3R - MOUNTED NOT WIRED
VIBRATION ISOLATION: 1" DEFLECTION SPRINGS
MOTOR COVER: YES

STACK AND NOZZLE:
CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZER,
INSULATED, HEAT TRACE CABLE
MODEL: BVS-12

MOTOR:
HP: 2, 1800 RPM, 208-230/460V, 3 PH,
TEFC - 213T FRAME SIZE, VFD READY, 1.15 S.F.
SHAFT GROUNDING: YES
MANUFACTURER: BROOK CROMPTON/WEG/TECO/
REGAL/PLASTICAIR'S CHOICE
LINE VOLTAGE REQUIREMENTS: 208-253, 414-506 VAC
STACK HEAT TRACE CABLE: 120 VAC

SYSTEM:
PLC WASHDOWN CONTROL PANEL:
SKYLEEDER-COLOR TOUCH SCREEN HMI WITH NEMA 1 CSA
LABELED CONTROL PANEL C/W TIMER.
WASH SEQUENCE FEEDBACK (ALARM NOTIFICATION) TO
ENSURE VALVES ARE WASHING AT EACH STATION
ISOLATION DAMPERS: 2 FRP ISOLATION DAMPERS,
COME WITH ACTUATORS
ROOF DUCT: FRP CONSTRUCTION
PVC FLEX CONNECTION C/W 316 SS BANDING STRAPS

GENERAL NOTES:
WINDLOAD RATING: 125 MPH [WITH GUY WIRES ATTACHED]
GUY WIRES: REQUIRED [BY OTHERS]
ALL FASTENERS 316SS
COLOR: PLASTICAIR STANDARD LIGHT GREY
WEIGHT: 550 LBS STACK / 520 LBS EACH FAN



UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DRAWN	C.B.		11/3/2023
CHECKED	Y.I.		11/3/2023
ENG APPR.			
MFG APPR.			

TITLE:		
31182-BVS-12 PERCHLORIC PEF-601A/B		
SIZE	DWG. NO.	REV
B	Q33182-1	1
SCALE: 1:48		SHEET 1 OF 2



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NEXT ASSY	USED ON	INTERPRET GEOMETRIC TOLERANCING PER: MATERIAL
APPLICATION		DO NOT SCALE DRAWING

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SUPPORT DETAILS

NOTE: IF STEEL SUPPORT OPTION IS CHOSEN IN LIEU OF GUY WIRES, FLANGE CONNECTIONS WILL STILL BE PROVIDED AS SHOWN. STEEL STRUCTURE SUPPORT BY OTHERS, FRP FLANGES PROVIDED BY PLASTICAIR.

TAG(S): PEF-601A/B
MODEL AND QTY: BVS-12 with 2xBCMPA-16 FANS (1 REDUNDANT)

FANS:
CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZERS
SPARK-RESISTANT CONSTRUCTION: NO
ARRANGEMENT: #9
FAN INLET SAFETY SCREEN: 304 SS
VFD: NOT INCLUDED
ACCESS DOOR: BOLTED
FAN DRAIN: YES
DISCONNECT: NEMA 3R - MOUNTED NOT WIRED
VIBRATION ISOLATION: 1" DEFLECTION SPRINGS
MOTOR COVER: YES

STACK AND NOZZLE:
CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZER, INSULATED, HEAT TRACE CABLE
MODEL: BVS-12

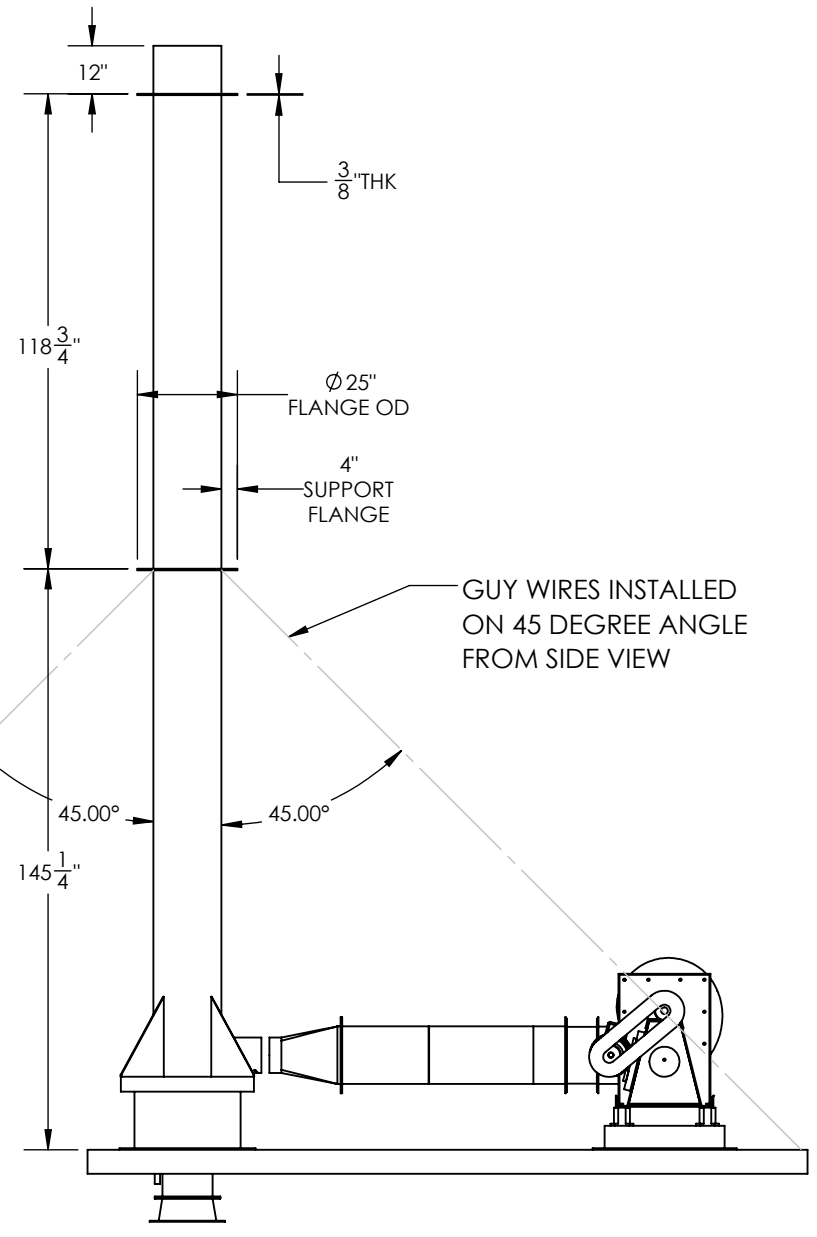
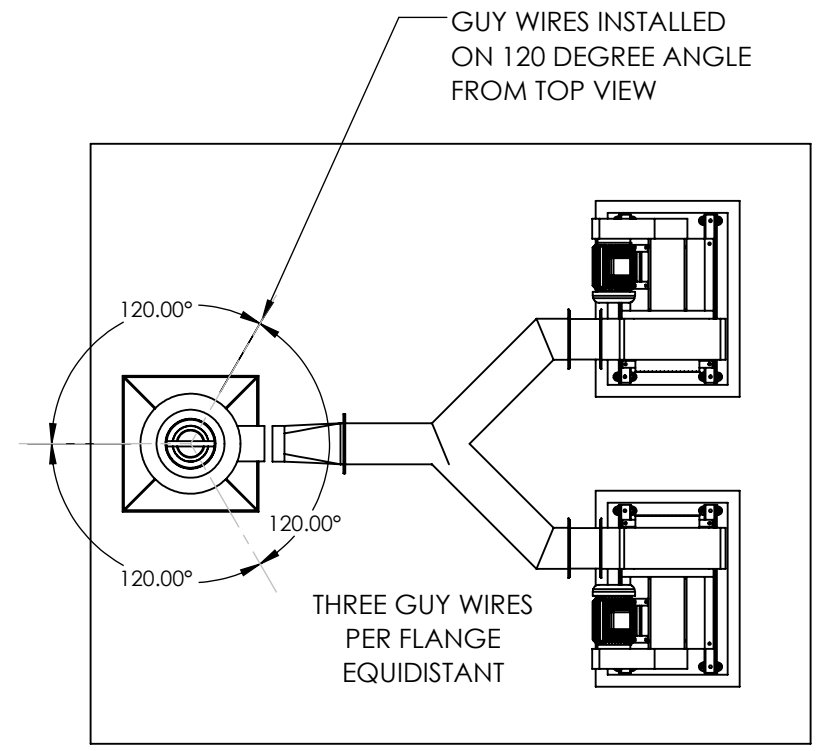
MOTOR:
HP: 2, 1800 RPM, 208-230/460V, 3 PH, TEFC - 213T FRAME SIZE, VFD READY, 1.15 S.F.
SHAFT GROUNDING: YES
MANUFACTURER: BROOK CROMPTON/WEG/TECO/REGAL/PLASTICAIR'S CHOICE
LINE VOLTAGE REQUIREMENTS: 208-253, 414-506 VAC
STACK HEAT TRACE CABLE: 120 VAC

SYSTEM:
PLC WASHDOWN CONTROL PANEL:
SKYLEEDER-COLOR TOUCH SCREEN HMI WITH NEMA 1 CSA LABELED CONTROL PANEL C/W TIMER.
WASH SEQUENCE FEEDBACK (ALARM NOTIFICATION) TO ENSURE VALVES ARE WASHING AT EACH STATION
ISOLATION DAMPERS: 2 FRP ISOLATION DAMPERS, COME WITH ACTUATORS
ROOF DUCT: FRP CONSTRUCTION
PVC FLEX CONNECTION C/W 316 SS BANDING STRAPS

GENERAL NOTES:
WINDLOAD RATING: 125 MPH [WITH GUY WIRES ATTACHED]
GUY WIRES: REQUIRED [BY OTHERS]
ALL FASTENERS 316SS
COLOR: PLASTICAIR STANDARD LIGHT GREY
WEIGHT: 550 LBS STACK / 520 LBS EACH FAN

B

B



A

A

UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: 31182-BVS-12 PERCHLORIC PEF-601A/B
DRAWN	C.B.	11/3/2023		
CHECKED	Y.I.	11/3/2023		
ENG APPR.				
MFG APPR.				
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/8" ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±				SIZE DWG. NO. REV B Q33182-2 1
INTERPRET GEOMETRIC TOLERANCING PER: MATERIAL				
NEXT ASSY		USED ON		SCALE: 1:48 SHEET 2 OF 2
APPLICATION		DO NOT SCALE DRAWING		



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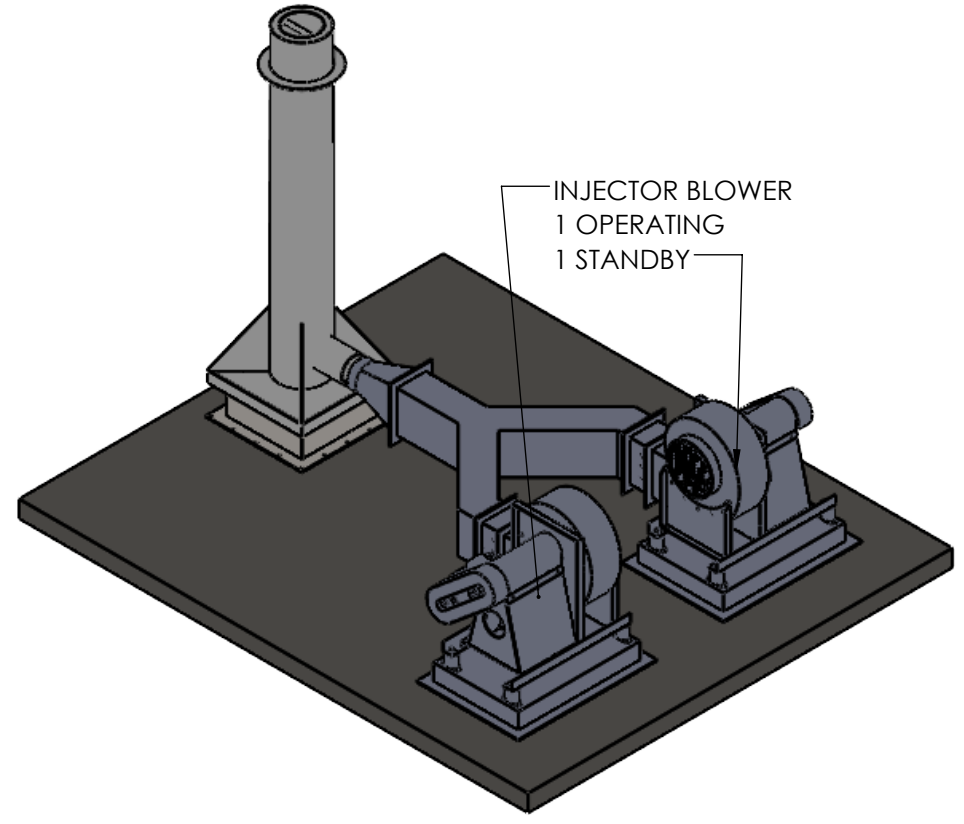
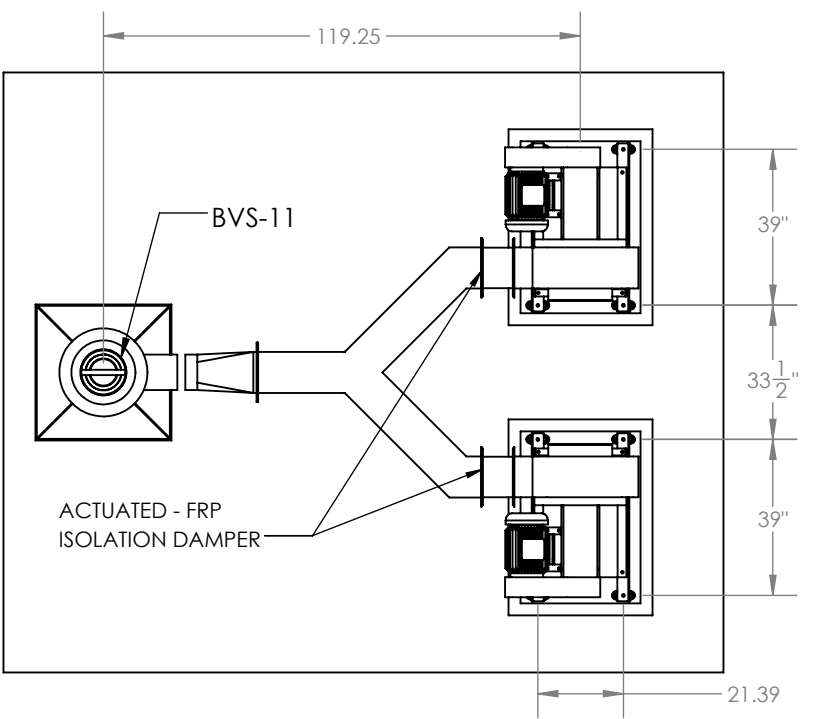
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TAG(S): EF-701-A/B
MODEL AND QTY: BVS-11 with 2xINJECTOR BLOWER (1 Redundant)

FANS:
 CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZERS
 SPARK-RESISTANT CONSTRUCTION: NO
 ARRANGEMENT: #9
 FAN INLET SAFETY SCREEN: 304 SS
 VFD: NOT INCLUDED
 ACCESS DOOR: BOLTED
 FAN DRAIN: YES
 DISCONNECT: NEMA 3R - MOUNTED NOT WIRED
 VIBRATION ISOLATION: 1" DEFLECTION SPRINGS
 MOTOR COVER: YES

STACK AND NOZZLE:
 CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZER, INSULATED, HEAT TRACE CABLE
 MODEL: BVS-11

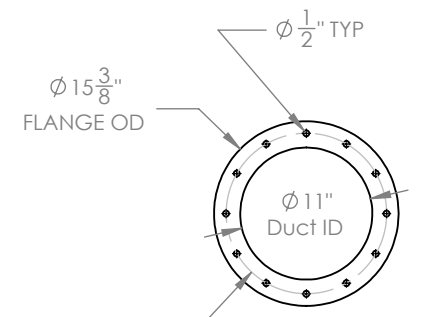
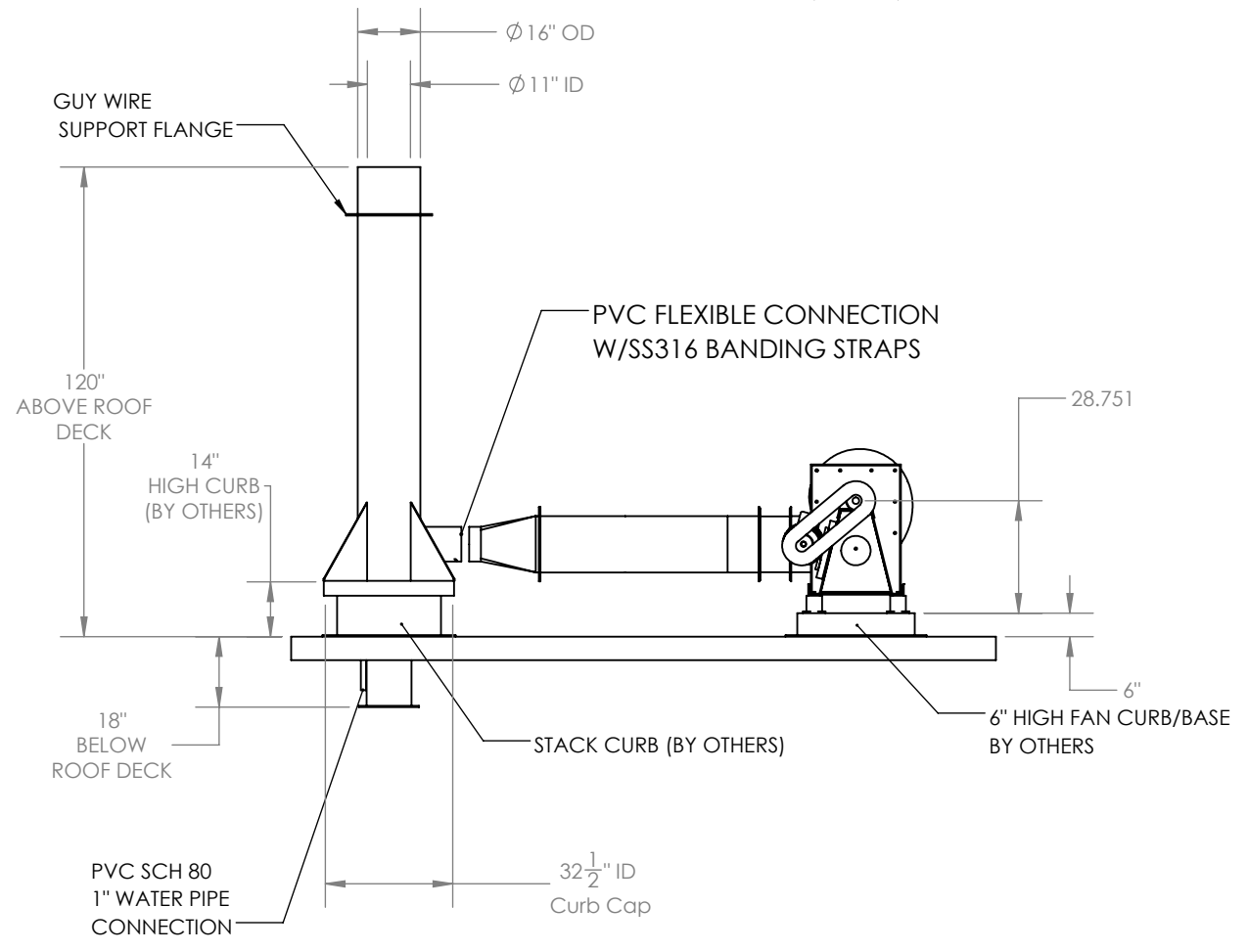
MOTOR:
 HP: 2.0, 1800 RPM, 230/460V, 3 PH,
 TEFC - 182T FRAME SIZE, VFD READY, 1.15 S.F.
 SHAFT GROUNDING: YES
 MANUFACTURER: BALDOR/WEG/TECO
 /REGAL/ PLASTICAIR CHOICE
 LINE VOLTAGE REQUIREMENTS: 208-253, 414-506 VAC
 STACK HEAT TRACE CABLE: 120 VAC

SYSTEM:
 PLC WASHDOWN CONTROL PANEL:
 - SKYLEEDER-COLOR TOUCH SCREEN HMI WITH NEMA 1 CSA LABELED CONTROL PANEL C/W TIMER.
 WASH SEQUENCE FEEDBACK (ALARM NOTIFICATION) TO ENSURE VALVES ARE WASHING AT EACH STATION
 ISOLATION DAMPERS: 2 FRP ISOLATION DAMPERS, COME WITH ACTUATORS
 ROOF DUCT: FRP CONSTRUCTION,
 PVC FLEX CONNECTION C/W 316 SS BANDING STRAPS

GENERAL NOTES:
 WINDLOAD RATING: 125 MPH [WITH GUY WIRES ATTACHED]
 GUY WIRES: REQUIRED
 ALL HARDWARE 316SS
 COLOR: PLASTICAIR STANDARD LIGHT GREY
 WEIGHT: 550 LBS STACK / 520 LBS EACH FAN

B

B



INLET FLANGE PATTERN
 $\phi 13 \frac{3}{8}$ " BOLT CIRCLE DIAMETER

A

A



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UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: 31182-BVS-11 PERCHLORIC
DRAWN		A.C.	8/28/2023	
CHECKED		Y.I.	8/28/2023	
ENG APPR.				
MFG APPR.				SIZE DWG. NO. REV B 33182-2 1
INTERPRET GEOMETRIC TOLERANCING PER:		COMMENTS:		
MATERIAL				
NEXT ASSY	USED ON			SCALE: 1:48
APPLICATION		DO NOT SCALE DRAWING		SHEET 1 OF 2

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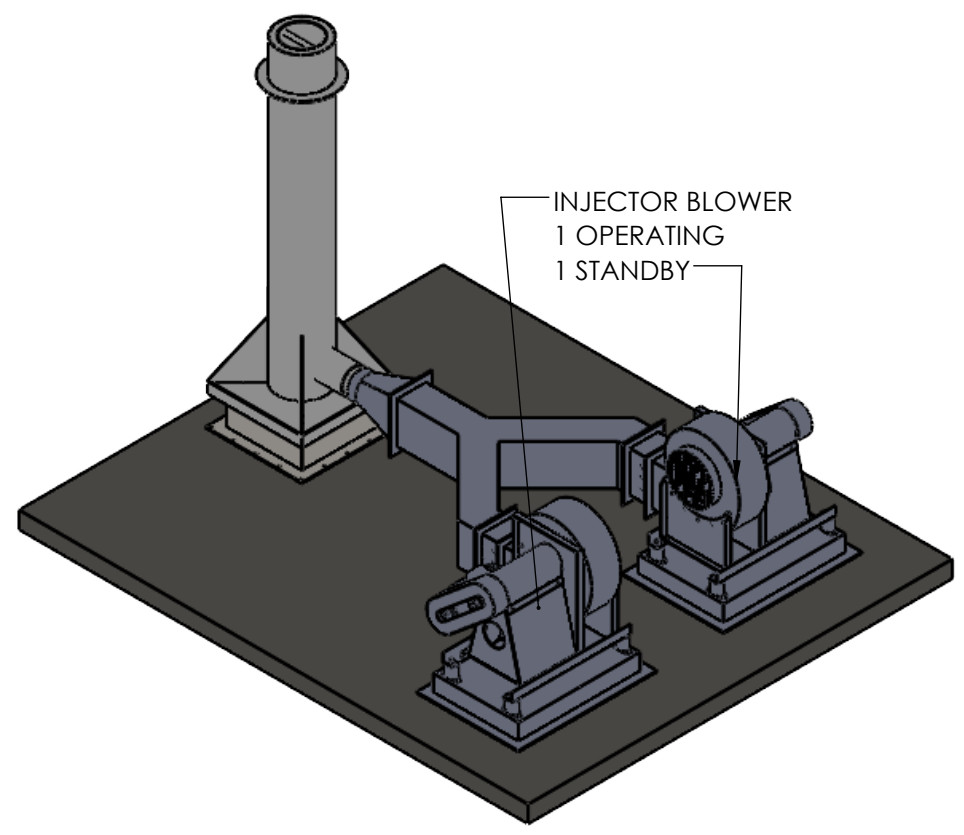
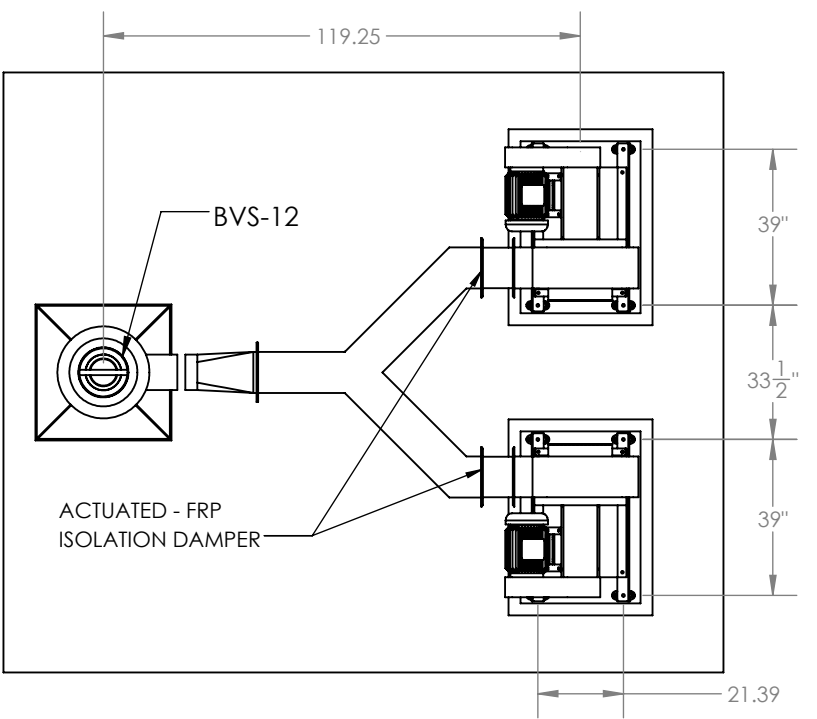
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TAG(S): EF-702A/B
MODEL AND QTY: BVS-12 with 2xINJECTOR BLOWER (1 Redundant)

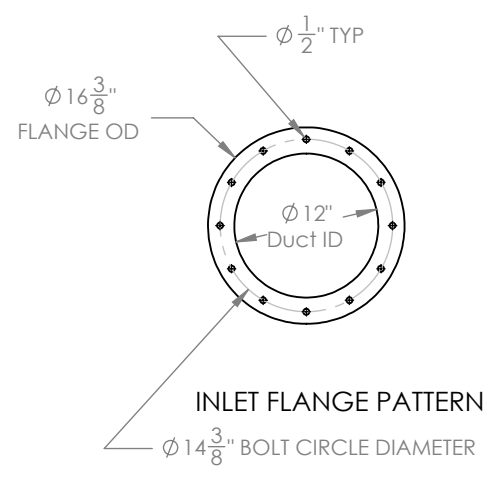
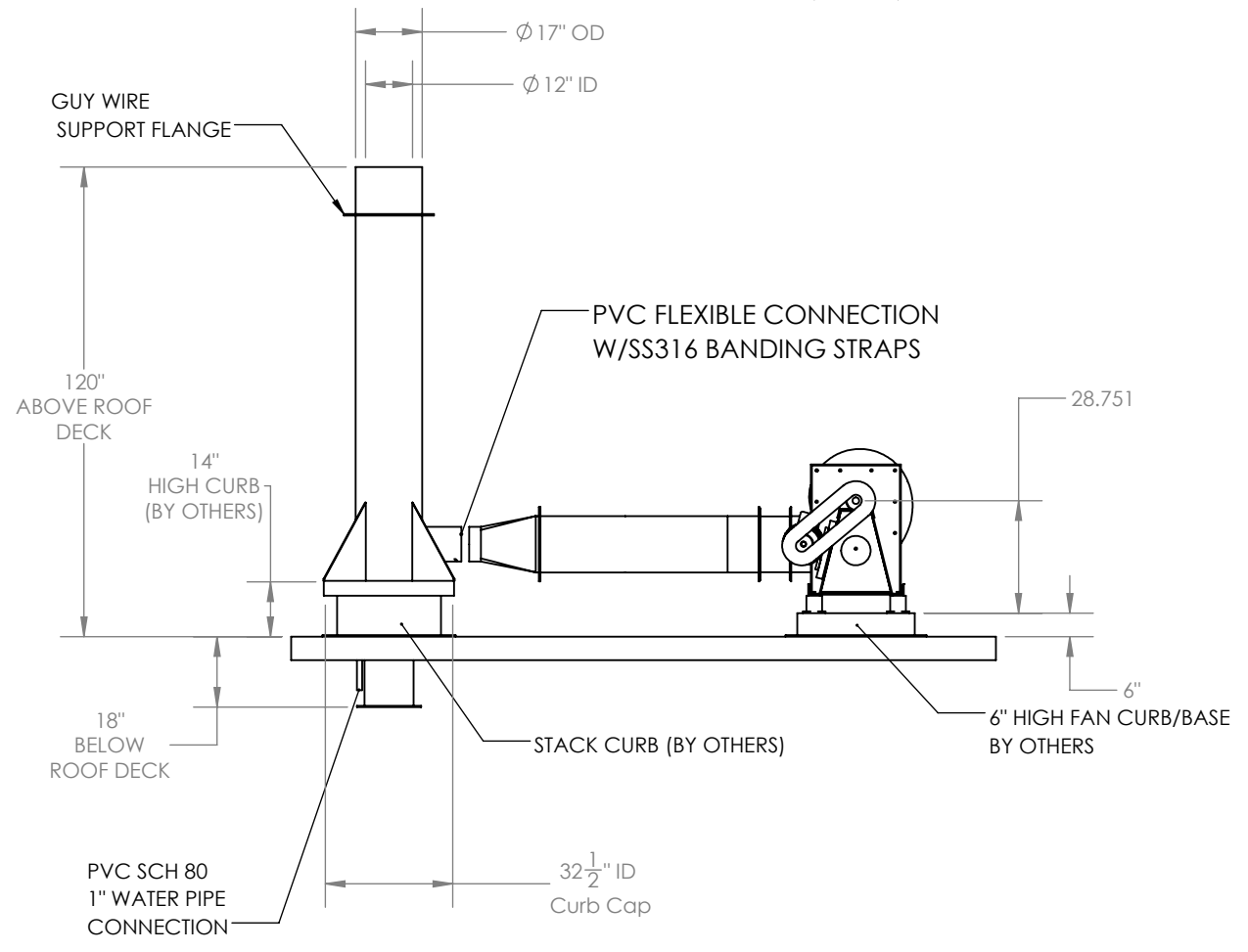
FANS:
 CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZERS
 SPARK-RESISTANT CONSTRUCTION: NO
 ARRANGEMENT: #9
 FAN INLET SAFETY SCREEN: 304 SS
 VFD: NOT INCLUDED
 ACCESS DOOR: BOLTED
 FAN DRAIN: YES
 DISCONNECT: NEMA 3R - MOUNTED NOT WIRED
 VIBRATION ISOLATION: 1" DEFLECTION SPRINGS
 MOTOR COVER: YES

STACK AND NOZZLE:
 CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZER, INSULATED, HEAT TRACE CABLE
 MODEL: BVS-12

MOTOR:
 HP: 2.0, 1750 RPM, 230/460V, 3 PH,
 TEFC - 145T FRAME SIZE, VFD READY, 1.15 S.F.
 SHAFT GROUNDING: YES
 MANUFACTURER: BALDOR/WEG/TECO
 /REGAL/ PLASTICAIR CHOICE
 LINE VOLTAGE REQUIREMENTS: 208-253, 414-506 VAC
 STACK HEAT TRACE CABLE: 120 VAC

SYSTEM:
 PLC WASHDOWN CONTROL PANEL:
 - SKYLEEDER-COLOR TOUCH SCREEN HMI WITH NEMA 1 CSA LABELED CONTROL PANEL C/W TIMER.
 WASH SEQUENCE FEEDBACK (ALARM NOTIFICATION) TO ENSURE VALVES ARE WASHING AT EACH STATION
 ISOLATION DAMPERS: 2 FRP ISOLATION DAMPERS, COME WITH ACTUATORS
 ROOF DUCT: FRP CONSTRUCTION,
 PVC FLEX CONNECTION C/W 316 SS BANDING STRAPS

GENERAL NOTES:
 WINDLOAD RATING: 125 MPH [WITH GUY WIRES ATTACHED]
 GUY WIRES: REQUIRED
 ALL HARDWARE 316SS
 COLOR: PLASTICAIR STANDARD LIGHT GREY
 WEIGHT: 550 LBS STACK / 520 LBS EACH FAN



UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: 31182-BVS-12 PERCHLORIC
DRAWN	C.B.	8/29/2023		
CHECKED	Y.I.	8/29/2023		
ENG APPR.				
MFG APPR.				
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/8" ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±				SIZE DWG. NO. REV B 33182-1 1
INTERPRET GEOMETRIC TOLERANCING PER: MATERIAL				
NEXT ASSY	USED ON	COMMENTS:		SCALE: 1:48 SHEET 1 OF 2
APPLICATION		DO NOT SCALE DRAWING		



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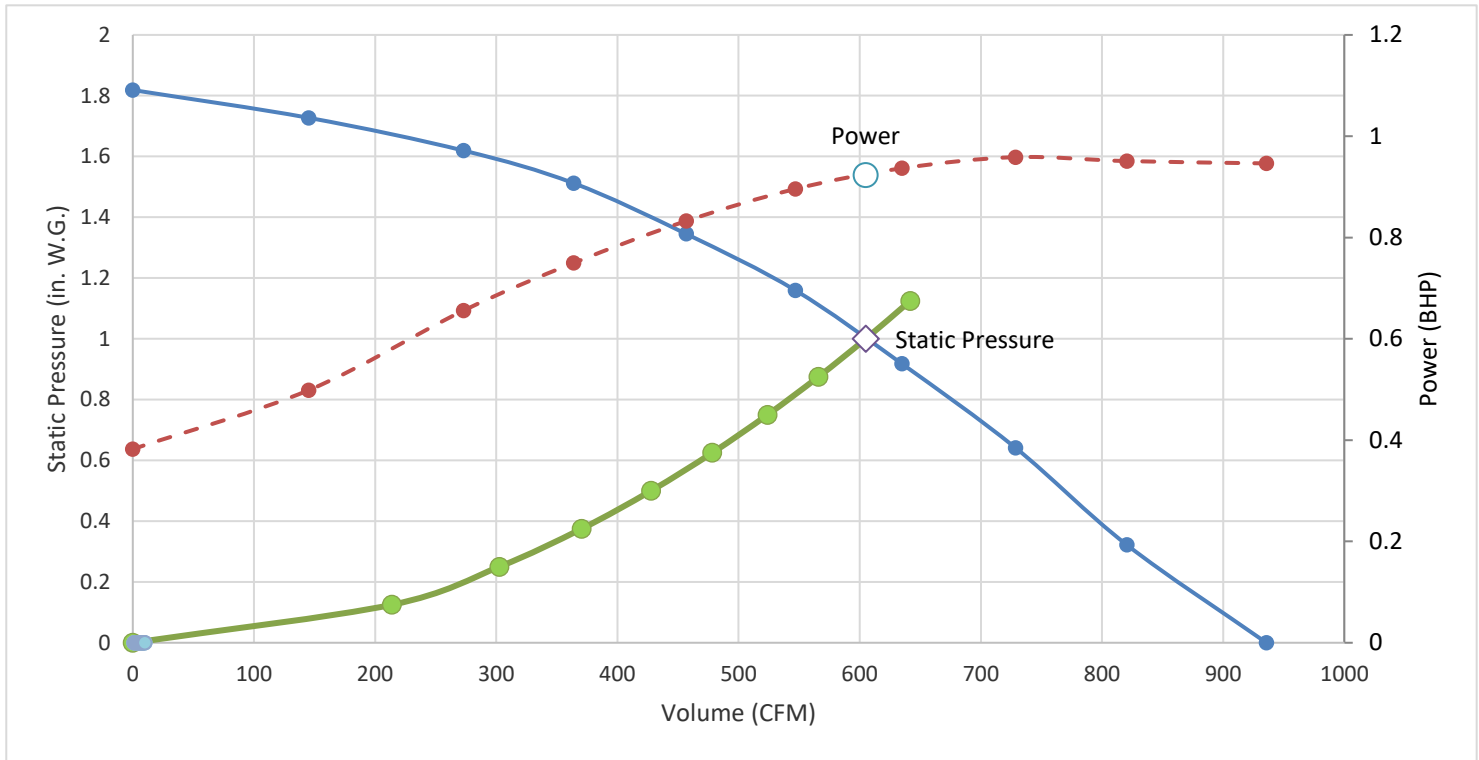


PLASTICAIR FAN PERFORMANCE

31182-2

4-Jan-24

Customer: 0	Fan Tag: PEF-701A/B
Rep: CFM Company	Fan Model: BVS-11
Job ID: USGS - EMRF Perchloric and Radioactive	



CFM	605	RPM:	1652	Static Pressure:	1.00	BHP	0.92
						FEI	1.31

Sound Data:

Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Inlet Sound Power Levels (dB)	89	94	88	83	78	76	74	71
Sound Pressure levels at 5 Feet (A-weighted) *	49	64	65	66	64	63	61	55

Total A-weighted Sound Pressure 5 Feet from Fan (dBA) *	72	Other Performance Data		Surrounding Data	
		Tip Speed (ft/min):	7569	Temperature °F :	70
		Outlet Velocity (ft/min):	3371	Altitude (ft) :	5800
				Density (lb/ft ³) :	0.0606

The environment for the fan installation effects the measured sound values, therefor the dBA levels cannot be guaranteed. A fans dBA is influenced by nearby sound reflecting surfaces. A-weighted Octave Band Sound Pressure levels (dBA) are not licensed by AMCA International. Please consult AMCA publication 303 for more information.

** The airstream temperature change result is a calculated estimation and should not be used for design purposes.

*** The Sound Pressure Levels are based on a fan installation next to No reflective surfaces



Customer:	0	Fan Tag:	PEF-701A/B
Rep:	CFM Company	Quote :	31182-2
Job ID:	USGS - EMRF Perchloric and Radioactive	Catalogued	

Silencer Insertion loss		Project Sound Performance							
Acoustic Windband insertion loss		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Select Silencer Size (Inch)	Silencer Pressure Drop								
	in.w.g								
		89	94	88	83	78	76	74	71
		90	95	90	85	80	77	75	72
Outlet Sound Power levels are tested as per AMCA Standards									



Plasticair Inc.

Perchloric Acid Exhaust System Selection Program
(Plasticair Model BVS)

1-Jun-23

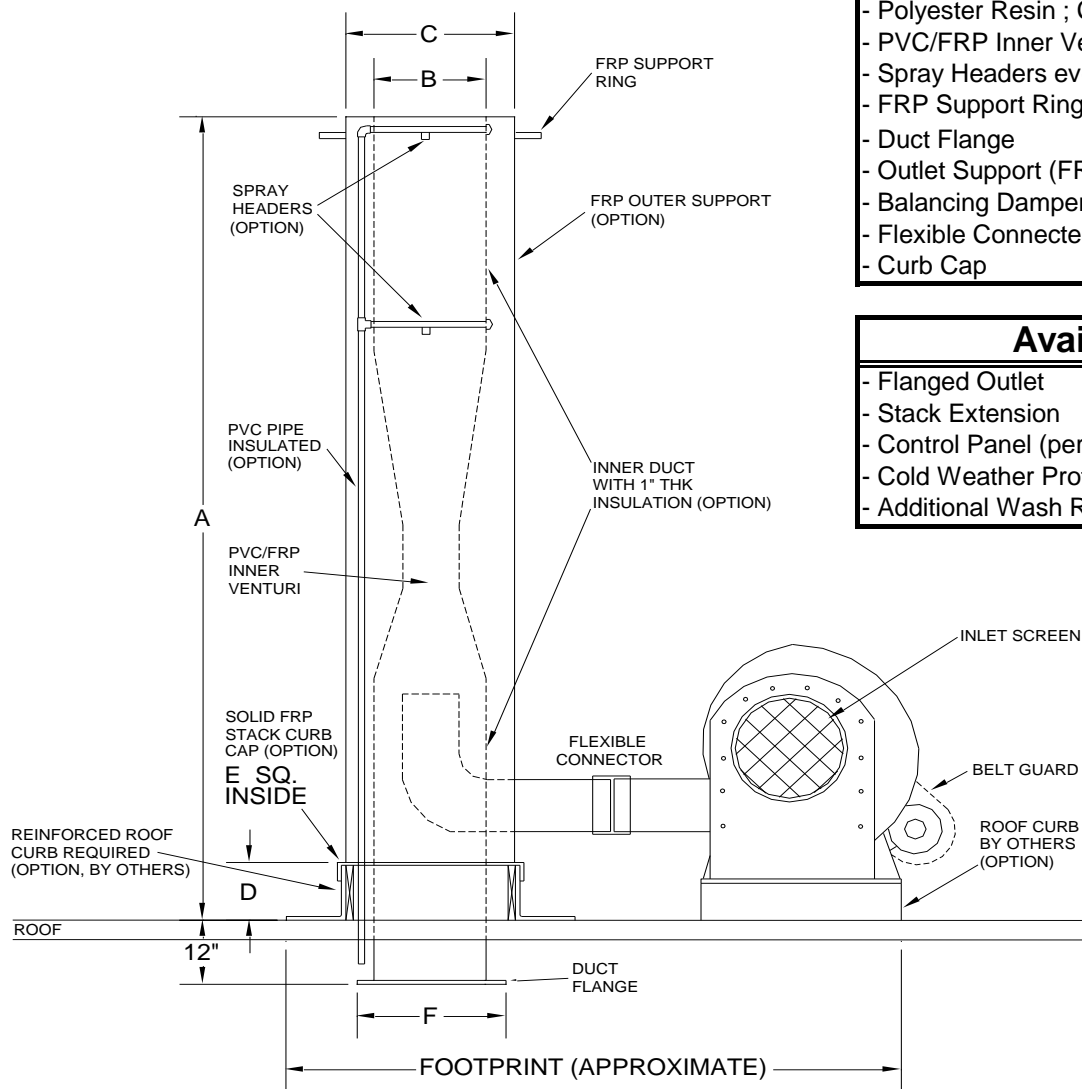
Quote No. : 31182-2		Fan Tag :	PEF-601A/B
Sales Rep : <i>CFM Company</i>		Project Name :	USGS - EMRF Perchloric and Radioactive
System Static Pressure (in. w.g.)	1.00	Selected Model	BVS-11
Induced Air Required (CFM)	605.00		
Fan Motor HP :	2		

Standard Features

- Polyester Resin ; Class 1 Flame Spread
- PVC/FRP Inner Venturi
- Spray Headers every 6 - 10 Feet
- FRP Support Ring
- Duct Flange
- Outlet Support (FRP)
- Balancing Damper
- Flexible Connector (PVC)
- Curb Cap

Available Options

- Flanged Outlet
- Stack Extension
- Control Panel (per spec)
- Cold Weather Protection
- Additional Wash Rings (for Duct)



General Dimensions (Inch)

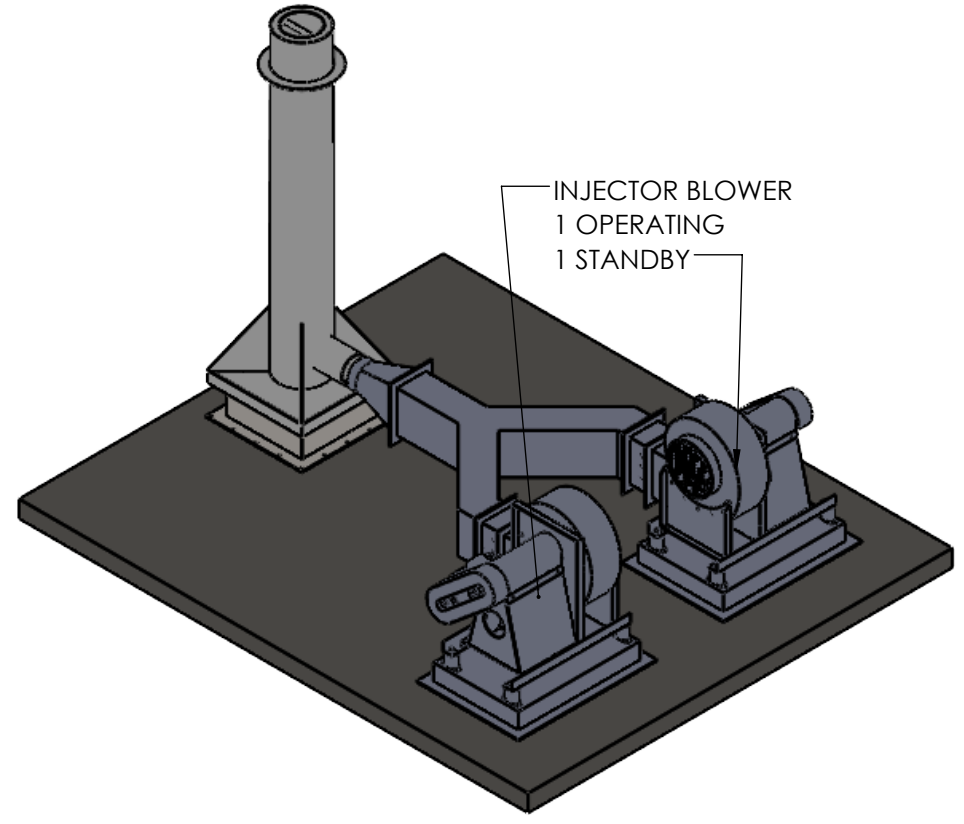
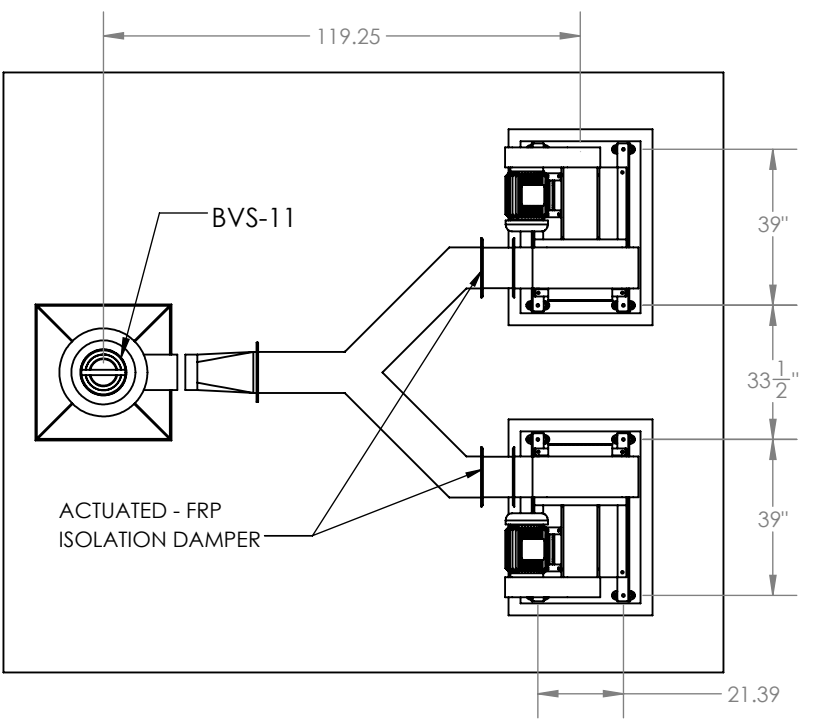
A	120
B	11
C	16
D	8
E	20
F	15 3/8

4

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TAG(S): EF-701-A/B
MODEL AND QTY: BVS-11 with 2xINJECTOR BLOWER (1 Redundant)

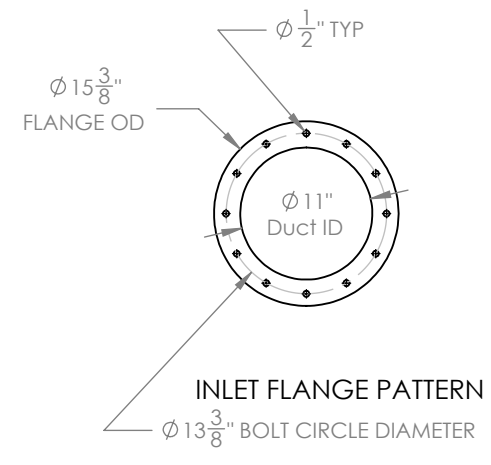
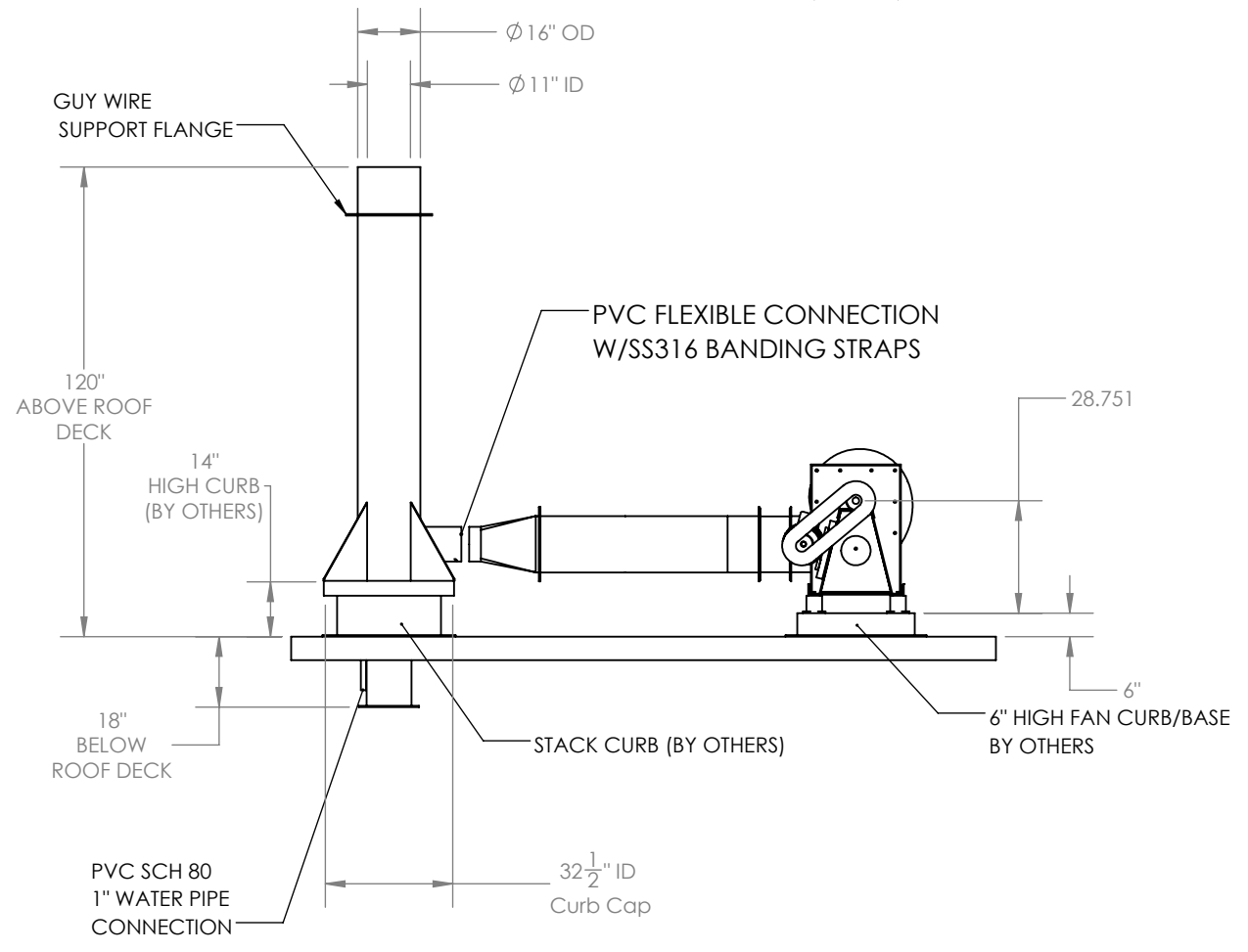
FANS:
 CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZERS
 SPARK-RESISTANT CONSTRUCTION: NO
 ARRANGEMENT: #9
 FAN INLET SAFETY SCREEN: 304 SS
 VFD: NOT INCLUDED
 ACCESS DOOR: BOLTED
 FAN DRAIN: YES
 DISCONNECT: NEMA 3R - MOUNTED NOT WIRED
 VIBRATION ISOLATION: 1" DEFLECTION SPRINGS
 MOTOR COVER: YES

STACK AND NOZZLE:
 CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZER, INSULATED, HEAT TRACE CABLE
 MODEL: BVS-11

MOTOR:
 HP: 2.0, 1800 RPM, 230/460V, 3 PH,
 TEFC - 182T FRAME SIZE, VFD READY, 1.15 S.F.
 SHAFT GROUNDING: YES
 MANUFACTURER: BALDOR/WEG/TECO
 /REGAL/ PLASTICAIR CHOICE
 LINE VOLTAGE REQUIREMENTS: 208-253, 414-506 VAC
 STACK HEAT TRACE CABLE: 120 VAC

SYSTEM:
 PLC WASHDOWN CONTROL PANEL:
 - SKYLEEDER-COLOR TOUCH SCREEN HMI WITH NEMA 1 CSA LABELED CONTROL PANEL C/W TIMER.
 WASH SEQUENCE FEEDBACK (ALARM NOTIFICATION) TO ENSURE VALVES ARE WASHING AT EACH STATION
 ISOLATION DAMPERS: 2 FRP ISOLATION DAMPERS, COME WITH ACTUATORS
 ROOF DUCT: FRP CONSTRUCTION,
 PVC FLEX CONNECTION C/W 316 SS BANDING STRAPS

GENERAL NOTES:
 WINDLOAD RATING: 125 MPH [WITH GUY WIRES ATTACHED]
 GUY WIRES: REQUIRED
 ALL HARDWARE 316SS
 COLOR: PLASTICAIR STANDARD LIGHT GREY
 WEIGHT: 550 LBS STACK / 520 LBS EACH FAN



UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: 31182-BVS-11 PERCHLORIC
DRAWN		A.C.	8/28/2023	
CHECKED		Y.I.	8/28/2023	
ENG APPR.				
MFG APPR.				
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/8" ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±				SIZE DWG. NO. REV B 33182-2 1
INTERPRET GEOMETRIC TOLERANCING PER: MATERIAL				
NEXT ASSY	USED ON	COMMENTS:		SCALE: 1:48
APPLICATION		DO NOT SCALE DRAWING		SHEET 1 OF 2



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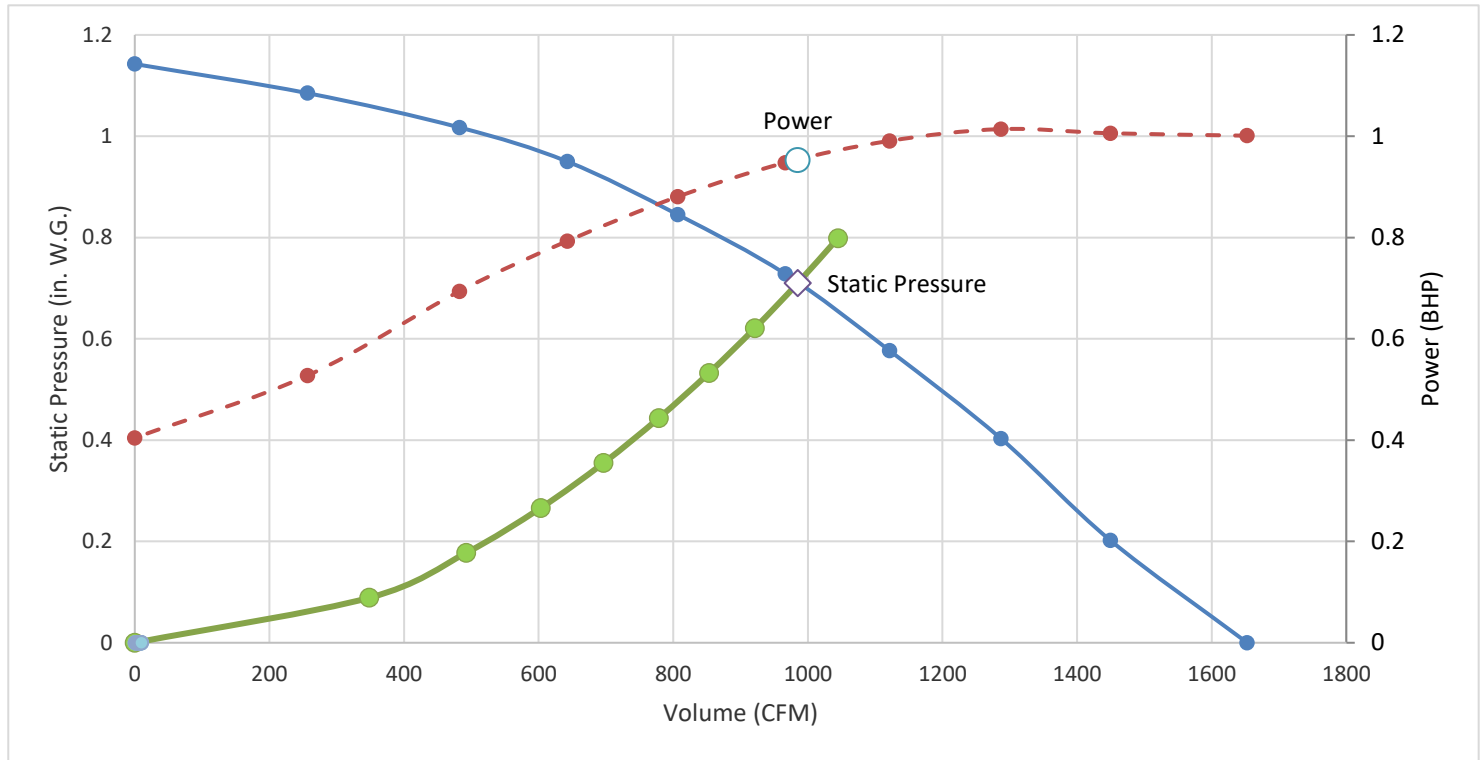


9-Jan-24

BVS PERFORMANCE

31182-2

Customer:	0	Fan Tag:	PEF-601A/B
Rep:	CFM Company	Fan Model:	BVS-12
Job ID:	USGS - EMRF Perchloric and Radioactive		



CFM	985	RPM:	1683	Static Pressure:	0.71	BHP	0.95
						FEI	1.33

Sound Data:

Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Inlet Sound Power Levels (dB)	89	95	89	84	79	77	75	71
Sound Pressure levels at 5 Feet (A-weighted) *	49	65	66	67	64	63	61	56

Total A-weighted Sound Pressure 5 Feet from Fan (dBA) *	73	Other Performance Data		Surrounding Data	
		Tip Speed (ft/min):	7712	Temperature °F :	70
		Outlet Velocity (ft/min):	3191	Altitude (ft) :	5800
				Density (lb/ft ³) :	0.0606

The environment for the fan installation effects the measured sound values, therefor the dBA levels cannot be guaranteed. A fans dBA is influenced by nearby sound reflecting surfaces. A-weighted Octave Band Sound Pressure levels (dBA) are not licensed by AMCA International. Please consult AMCA publication 303 for more information.

** The airstream temperature change result is a calculated estimation and should not be used for design purposes.

*** The Sound Pressure Levels are based on a fan installation next to No reflective surfaces



Customer:	0	Fan Tag:	PEF-601A/B
Rep:	CFM Company	Quote :	31182-2
Job ID:	USGS - EMRF Perchloric and Radioactive	Catalogued	

Select Silencer Size (Inch)	Silencer Pressure Drop	in.w.g	Project Sound Performance							
			63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Inlet Sound Power Levels (dBA)			89	95	89	84	79	77	75	71
Outlet Sound Power Levels (dBA)			90	96	91	86	81	78	76	72
Outlet Sound Power levels are tested as per AMCA Standards										



Plasticair Inc.

Perchloric Acid Exhaust System Selection Program

(Plasticair Model BVS)

9-Jan-24

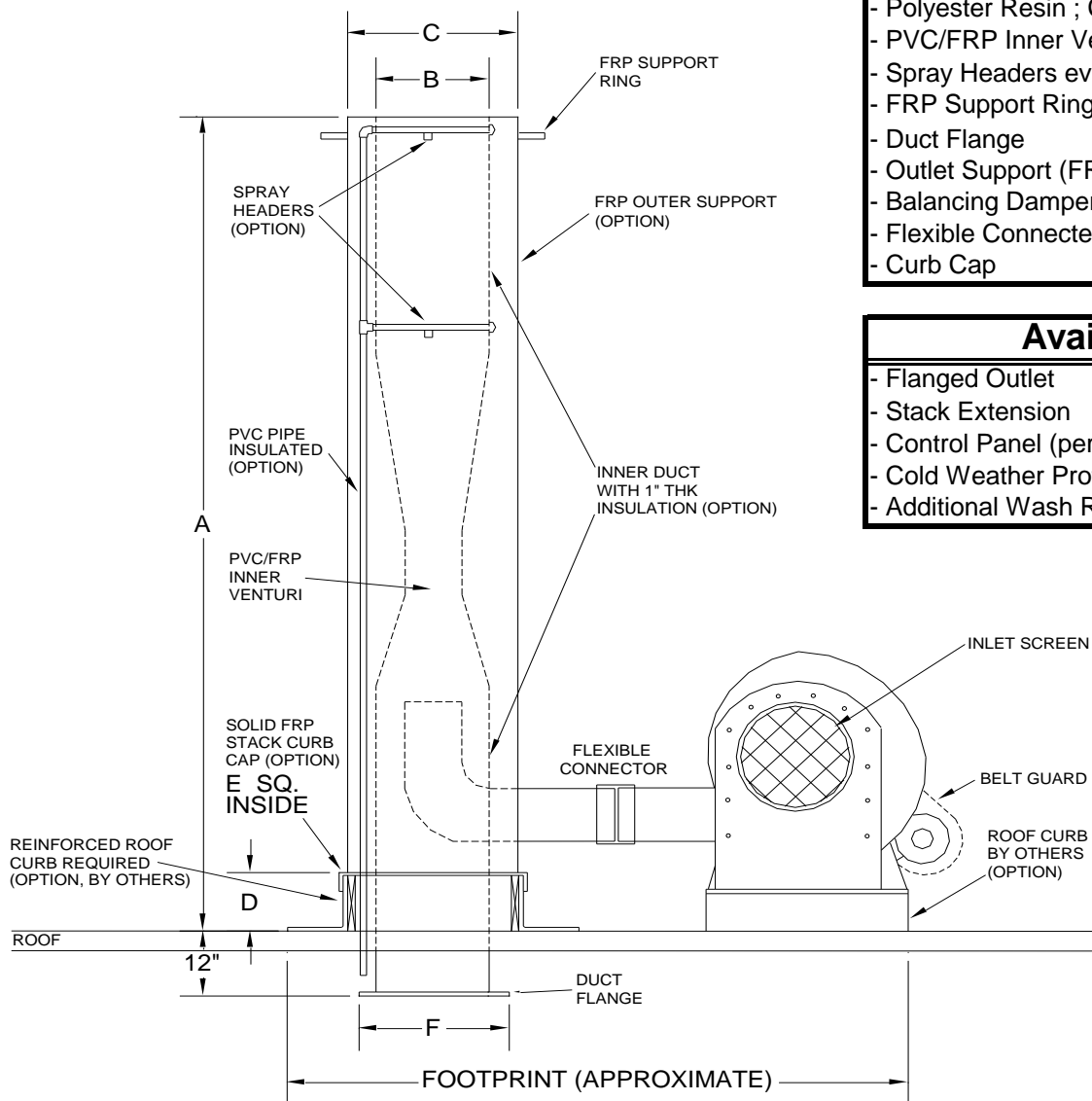
Quote No. : 31182-2		Fan Tag : PEF-601A/B
Sales Rep : <i>CFM Company</i>		Project Name : USGS - EMRF Perchloric and Radioactive
System Static Pressure (in. w.g.)	0.71	Selected Model
Induced Air Required (CFM)	985.00	
Fan Motor HP :	2	BVS-12

Standard Features

- Polyester Resin ; Class 1 Flame Spread
- PVC/FRP Inner Venturi
- Spray Headers every 6 - 10 Feet
- FRP Support Ring
- Duct Flange
- Outlet Support (FRP)
- Balancing Damper
- Flexible Connector (PVC)
- Curb Cap

Available Options

- Flanged Outlet
- Stack Extension
- Control Panel (per spec)
- Cold Weather Protection
- Additional Wash Rings (for Duct)



General Dimensions (Inch)

A	120
B	12
C	17
D	10
E	21
F	16 3/8

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PERFORMANCE: 985CFM AT 0.71" W.G.

TAG(S): PEF-601A/B
MODEL AND QTY: BVS-12 with 2xBCMPA-16 FANS (1 REDUNDANT)

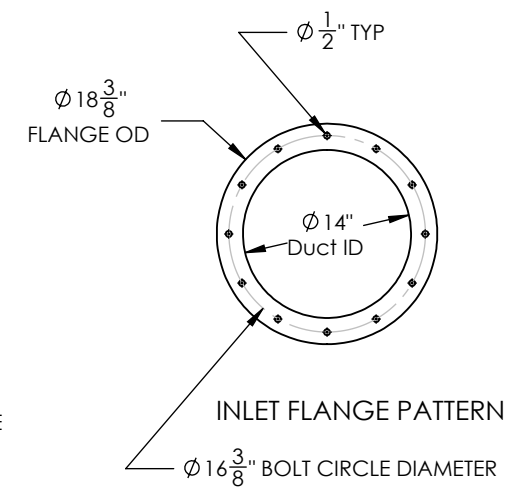
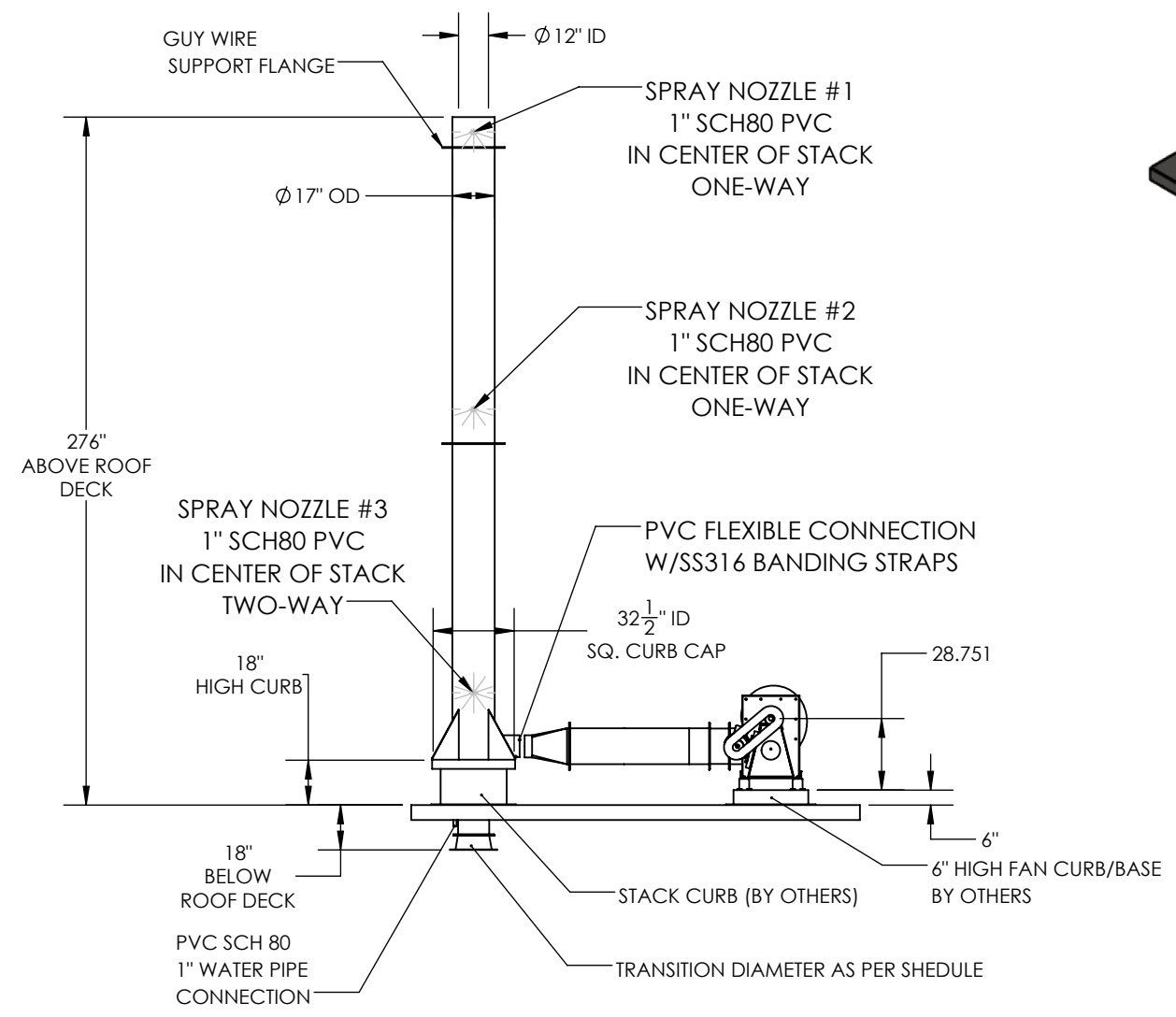
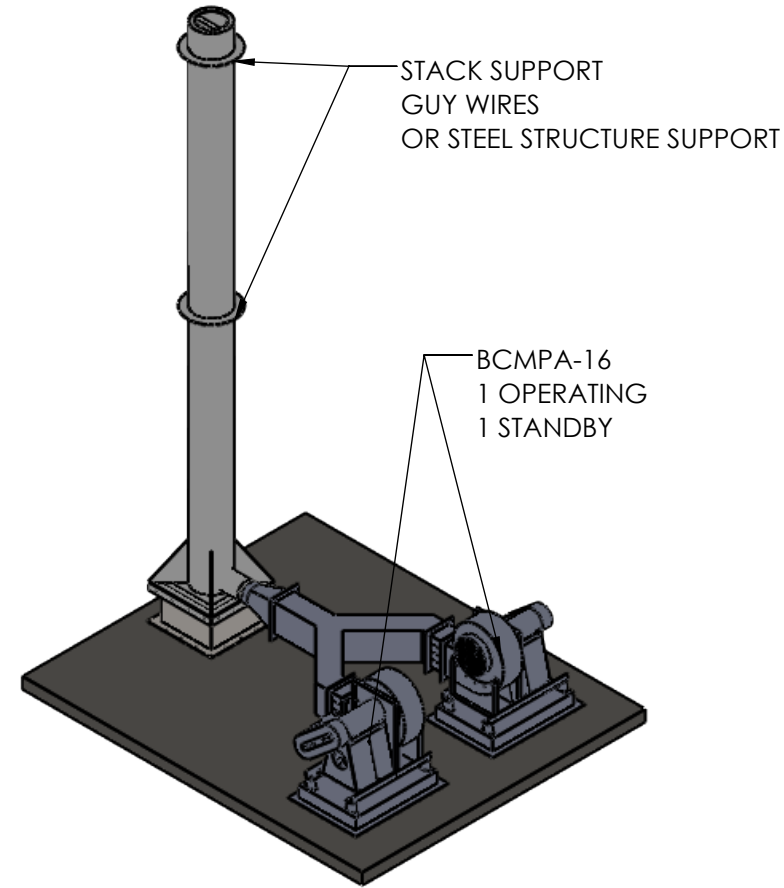
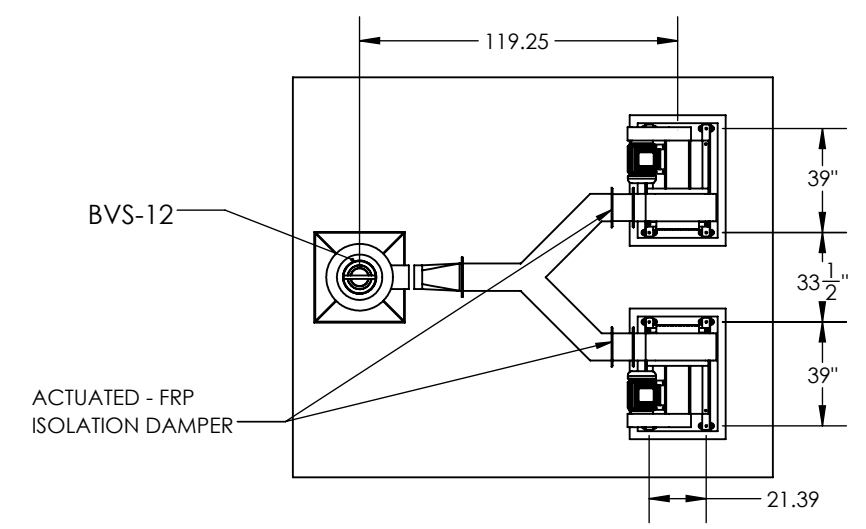
FANS:
CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZERS
SPARK-RESISTANT CONSTRUCTION: NO
ARRANGEMENT: #9
FAN INLET SAFETY SCREEN: 304 SS
VFD: NOT INCLUDED
ACCESS DOOR: BOLTED
FAN DRAIN: YES
DISCONNECT: NEMA 3R - MOUNTED NOT WIRED
VIBRATION ISOLATION: 1" DEFLECTION SPRINGS
MOTOR COVER: YES

STACK AND NOZZLE:
CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZER,
INSULATED, HEAT TRACE CABLE
MODEL: BVS-12

MOTOR:
HP: 2, 1800 RPM, 208-230/460V, 3 PH,
TEFC - 213T FRAME SIZE, VFD READY, 1.15 S.F.
SHAFT GROUNDING: YES
MANUFACTURER: BROOK CROMPTON/WEG/TECO/
REGAL/PLASTICAIR'S CHOICE
LINE VOLTAGE REQUIREMENTS: 208-253, 414-506 VAC
STACK HEAT TRACE CABLE: 120 VAC

SYSTEM:
PLC WASHDOWN CONTROL PANEL:
SKYLEEDER-COLOR TOUCH SCREEN HMI WITH NEMA 1 CSA
LABELED CONTROL PANEL C/W TIMER.
WASH SEQUENCE FEEDBACK (ALARM NOTIFICATION) TO
ENSURE VALVES ARE WASHING AT EACH STATION
ISOLATION DAMPERS: 2 FRP ISOLATION DAMPERS,
COME WITH ACTUATORS
ROOF DUCT: FRP CONSTRUCTION
PVC FLEX CONNECTION C/W 316 SS BANDING STRAPS

GENERAL NOTES:
WINDLOAD RATING: 125 MPH [WITH GUY WIRES ATTACHED]
GUY WIRES: REQUIRED [BY OTHERS]
ALL FASTENERS 316SS
COLOR: PLASTICAIR STANDARD LIGHT GREY
WEIGHT: 550 LBS STACK / 520 LBS EACH FAN



UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DRAWN	C.B.		11/3/2023
CHECKED	Y.I.		11/3/2023
ENG APPR.			
MFG APPR.			

TITLE:			
31182-BVS-12 PERCHLORIC PEF-601A/B			
SIZE	DWG. NO.	REV	
B	Q33182-1	1	
SCALE: 1:48		SHEET 1 OF 2	



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NEXT ASSY	USED ON	INTERPRET GEOMETRIC TOLERANCING PER: MATERIAL
APPLICATION		DO NOT SCALE DRAWING

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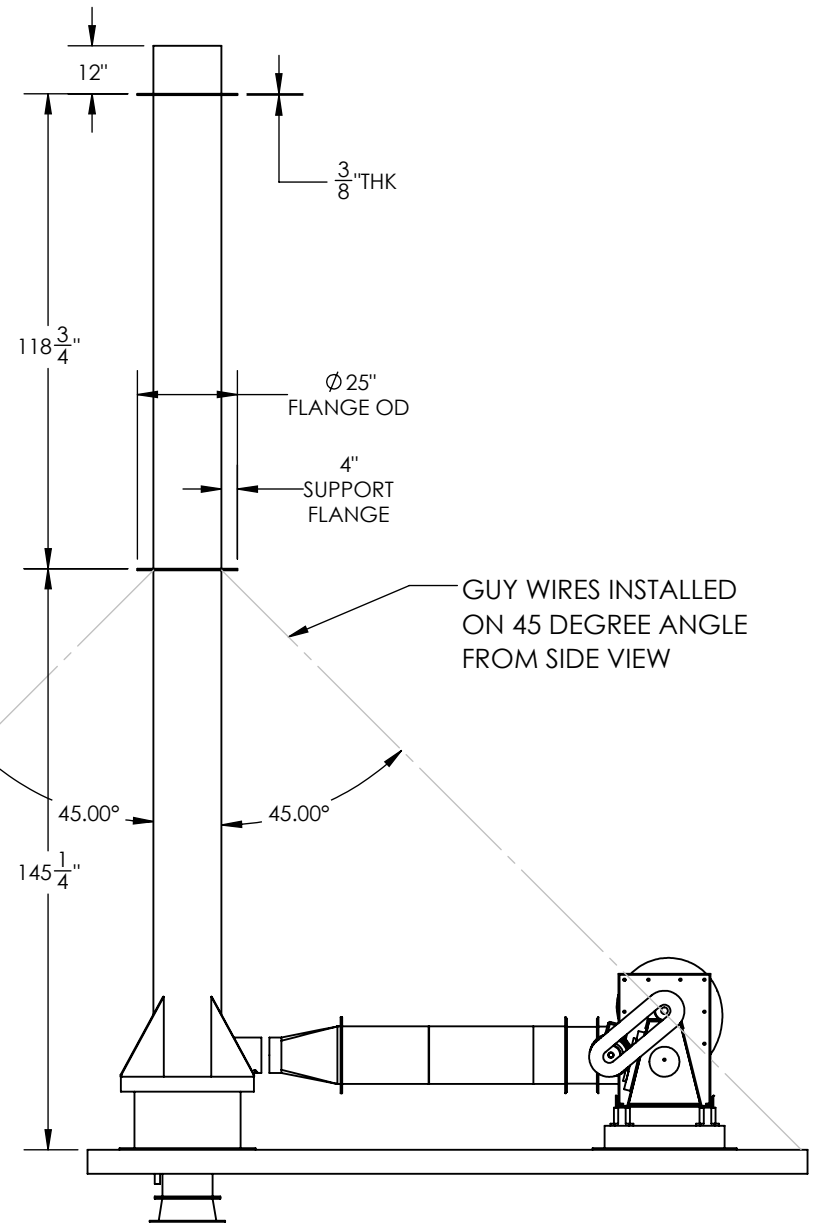
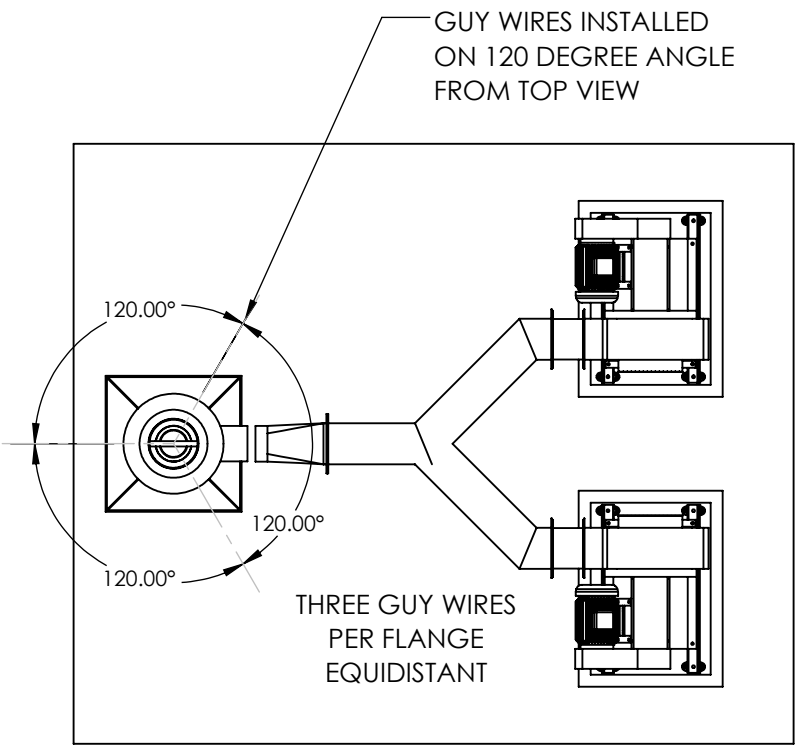
3

2

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SUPPORT DETAILS

NOTE: IF STEEL SUPPORT OPTION IS CHOSEN IN LIEU OF GUY WIRES, FLANGE CONNECTIONS WILL STILL BE PROVIDED AS SHOWN. STEEL STRUCTURE SUPPORT BY OTHERS, FRP FLANGES PROVIDED BY PLASTICAIR.



TAG(S): PEF-601A/B
MODEL AND QTY: BVS-12 with 2xBCMPA-16 FANS (1 REDUNDANT)

FANS:
 CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZERS
 SPARK-RESISTANT CONSTRUCTION: NO
 ARRANGEMENT: #9
 FAN INLET SAFETY SCREEN: 304 SS
 VFD: NOT INCLUDED
 ACCESS DOOR: BOLTED
 FAN DRAIN: YES
 DISCONNECT: NEMA 3R - MOUNTED NOT WIRED
 VIBRATION ISOLATION: 1" DEFLECTION SPRINGS
 MOTOR COVER: YES

STACK AND NOZZLE:
 CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZER, INSULATED, HEAT TRACE CABLE
 MODEL: BVS-12

MOTOR:
 HP: 2, 1800 RPM, 208-230/460V, 3 PH,
 TEFC - 213T FRAME SIZE, VFD READY, 1.15 S.F.
 SHAFT GROUNDING: YES
 MANUFACTURER: BROOK CROMPTON/WEG/TECO/
 REGAL/PLASTICAIR'S CHOICE
 LINE VOLTAGE REQUIREMENTS: 208-253, 414-506 VAC
 STACK HEAT TRACE CABLE: 120 VAC

SYSTEM:
 PLC WASHDOWN CONTROL PANEL:
 SKYLEEDER-COLOR TOUCH SCREEN HMI WITH NEMA 1 CSA LABELED CONTROL PANEL C/W TIMER.
 WASH SEQUENCE FEEDBACK (ALARM NOTIFICATION) TO ENSURE VALVES ARE WASHING AT EACH STATION
 ISOLATION DAMPERS: 2 FRP ISOLATION DAMPERS, COME WITH ACTUATORS
 ROOF DUCT: FRP CONSTRUCTION
 PVC FLEX CONNECTION C/W 316 SS BANDING STRAPS

GENERAL NOTES:
 WINDLOAD RATING: 125 MPH [WITH GUY WIRES ATTACHED]
 GUY WIRES: REQUIRED [BY OTHERS]
 ALL FASTENERS 316SS
 COLOR: PLASTICAIR STANDARD LIGHT GREY
 WEIGHT: 550 LBS STACK / 520 LBS EACH FAN

UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: 31182-BVS-12 PERCHLORIC PEF-601A/B
DRAWN		C.B.	11/3/2023	
CHECKED		Y.I.	11/3/2023	
ENG APPR.				
MFG APPR.				
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/8" ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±				SIZE DWG. NO. REV B Q33182-2 1
INTERPRET GEOMETRIC TOLERANCING PER: MATERIAL				
NEXT ASSY		USED ON		SCALE: 1:48 SHEET 2 OF 2
APPLICATION		DO NOT SCALE DRAWING		



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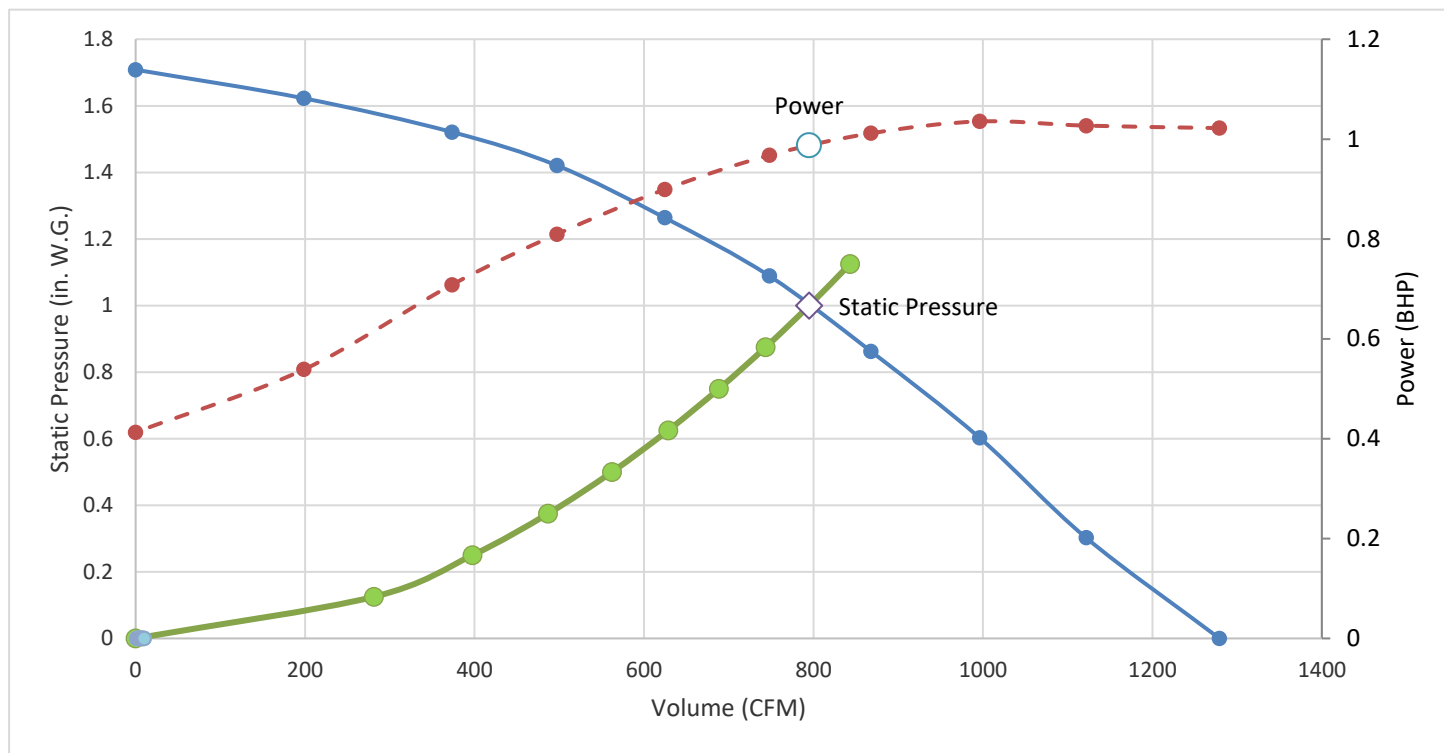


9-Jan-24

BVS PERFORMANCE

31182-2

Customer:	0	Fan Tag:	PEF-702A/B
Rep:	CFM Company	Fan Model:	BVS-12
Job ID:	USGS - EMRF Perchloric and Radioactive		



CFM	795	RPM:	1695	Static Pressure:	1.00	BHP	0.99
						FEI	1.31

Sound Data:

Octave Band Centre Frequency	63	125	250	500	1K	2K	4K	8K
Inlet Sound Power Levels (dB)	89	95	89	84	79	77	75	72
Sound Pressure levels at 5 Feet (A-weighted) *	49	65	66	67	64	64	62	56

Total A-weighted Sound Pressure 5 Feet from Fan (dBA) *	73	Other Performance Data		Surrounding Data	
		Tip Speed (ft/min):	7766	Temperature °F :	70
		Outlet Velocity (ft/min):	3046	Altitude (ft) :	5800
				Density (lb/ft ³) :	0.0606

The environment for the fan installation effects the measured sound values, therefor the dBA levels cannot be guaranteed. A fans dBA is influenced by nearby sound reflecting surfaces. A-weighted Octave Band Sound Pressure levels (dBA) are not licensed by AMCA International. Please consult AMCA publication 303 for more information.

** The airstream temperature change result is a calculated estimation and should not be used for design purposes.

*** The Sound Pressure Levels are based on a fan installation next to No reflective surfaces



Customer:	0	Fan Tag:	PEF-702A/B
Rep:	CFM Company	Quote :	31182-2
Job ID:	USGS - EMRF Perchloric and Radioactive	Catalogoued	

Silencer Insertion loss		Project Sound Performance							
Acoustic Windband insertion loss		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Select Silencer Size (Inch)									
Silencer Pressure Drop	in.w.g								
Inlet Sound Power Levels (dBA)		89	95	89	84	79	77	75	72
Outlet Sound Power Levels (dBA)		90	96	91	86	81	78	76	73
Outlet Sound Power levels are tested as per AMCA Standards									



Plasticair Inc.

Perchloric Acid Exhaust System Selection Program

(Plasticair Model BVS)

9-Jan-24

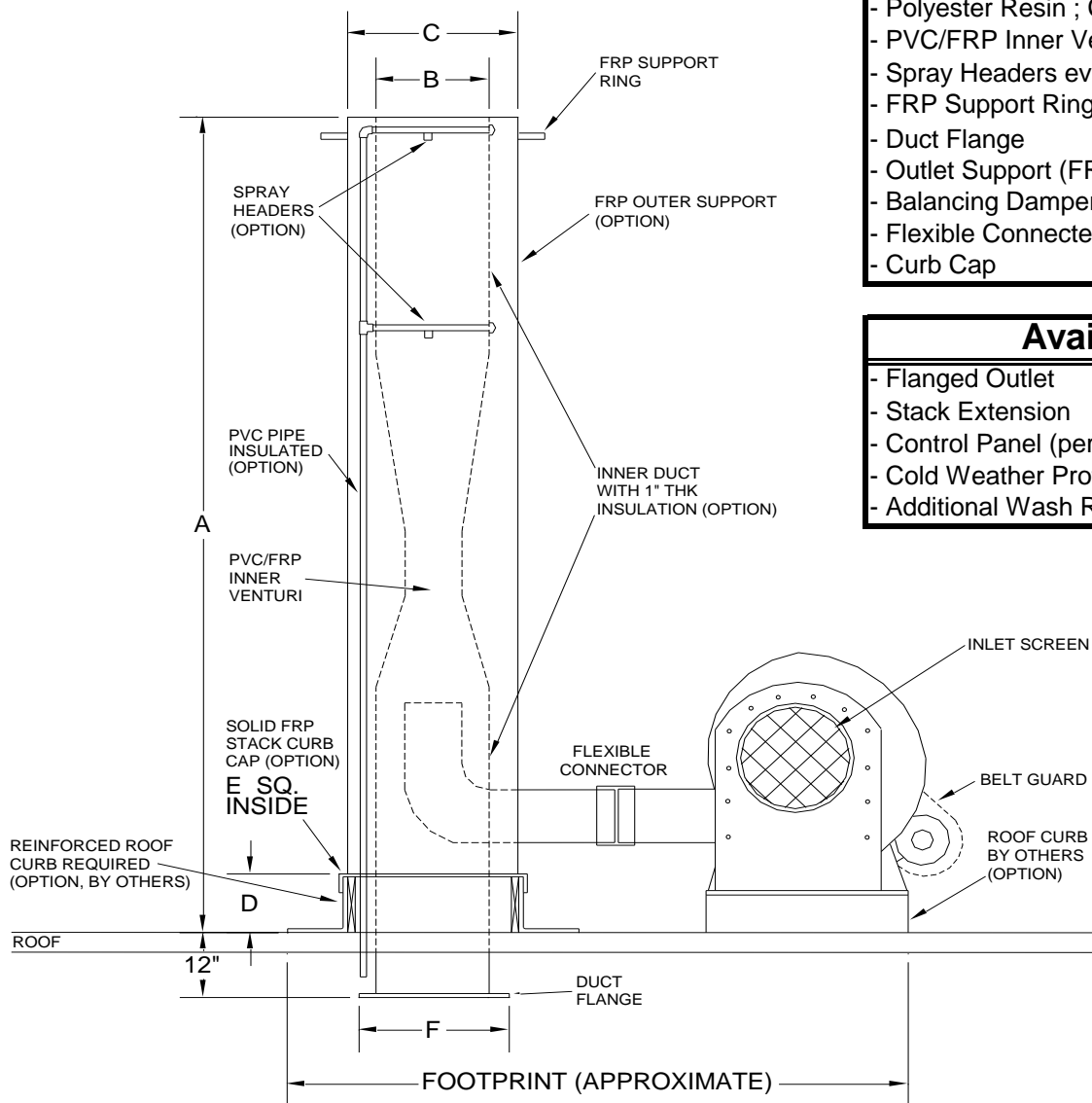
Quote No. : 31182-2		Fan Tag : PEF-702A/B
Sales Rep : <i>CFM Company</i>		Project Name : USGS - EMRF Perchloric and Radioactive
System Static Pressure (in. w.g.)	1.00	Selected Model
Induced Air Required (CFM)	795.00	
Fan Motor HP :	2	BVS-12

Standard Features

- Polyester Resin ; Class 1 Flame Spread
- PVC/FRP Inner Venturi
- Spray Headers every 6 - 10 Feet
- FRP Support Ring
- Duct Flange
- Outlet Support (FRP)
- Balancing Damper
- Flexible Connector (PVC)
- Curb Cap

Available Options

- Flanged Outlet
- Stack Extension
- Control Panel (per spec)
- Cold Weather Protection
- Additional Wash Rings (for Duct)



General Dimensions (Inch)

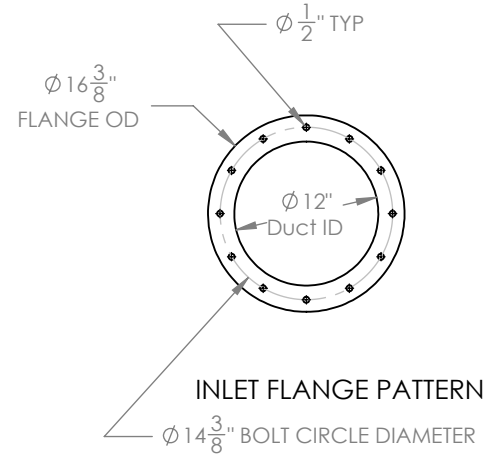
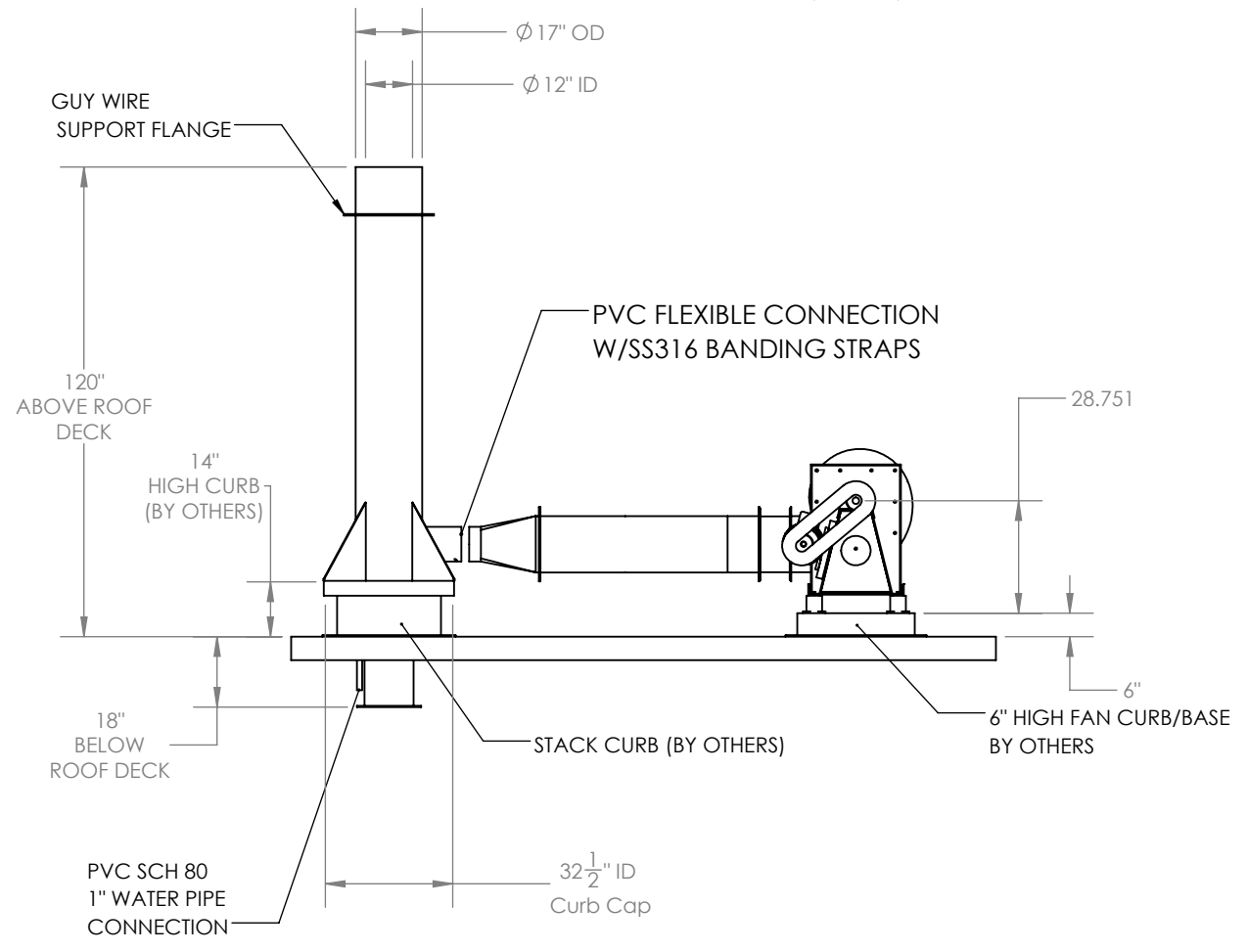
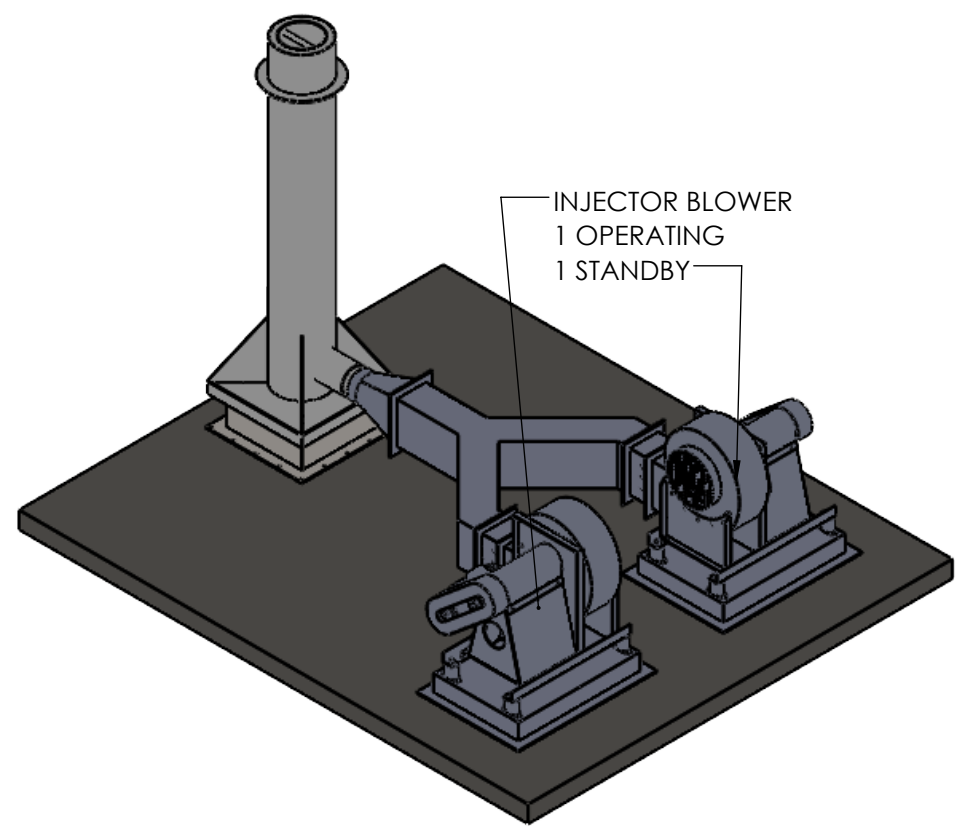
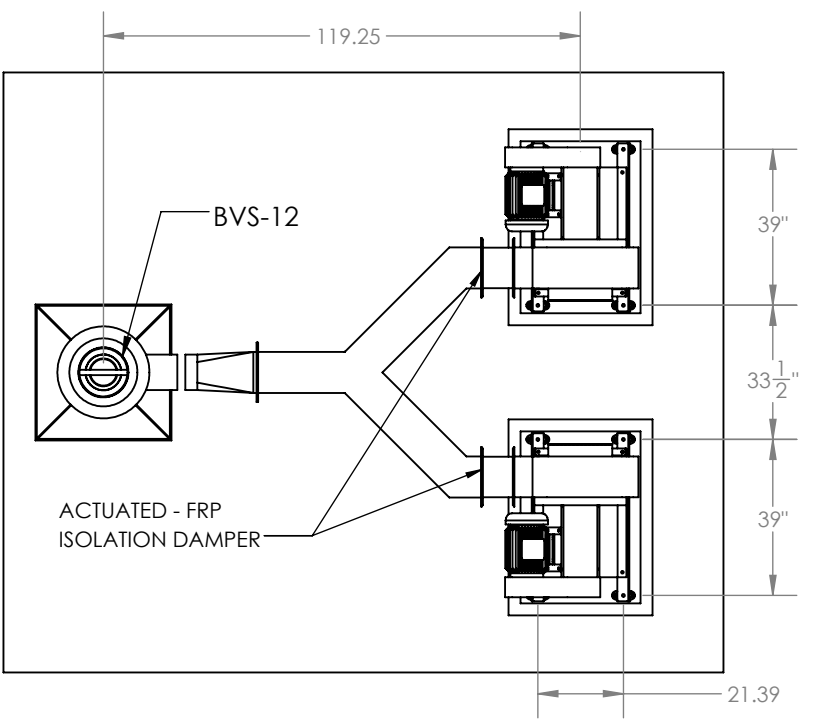
A	120
B	12
C	17
D	10
E	21
F	16 3/8

4

3

2

1



TAG(S): EF-702A/B
MODEL AND QTY: BVS-12 with 2xINJECTOR BLOWER (1 Redundant)

FANS:
 CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZERS
 SPARK-RESISTANT CONSTRUCTION: NO
 ARRANGEMENT: #9
 FAN INLET SAFETY SCREEN: 304 SS
 VFD: NOT INCLUDED
 ACCESS DOOR: BOLTED
 FAN DRAIN: YES
 DISCONNECT: NEMA 3R - MOUNTED NOT WIRED
 VIBRATION ISOLATION: 1" DEFLECTION SPRINGS
 MOTOR COVER: YES

STACK AND NOZZLE:
 CONSTRUCTION: HIGH STRENGTH FRP WITH UV STABILIZER, INSULATED, HEAT TRACE CABLE
 MODEL: BVS-12

MOTOR:
 HP: 2.0, 1750 RPM, 230/460V, 3 PH,
 TEFC - 145T FRAME SIZE, VFD READY, 1.15 S.F.
 SHAFT GROUNDING: YES
 MANUFACTURER: BALDOR/WEG/TECO
 /REGAL/ PLASTICAIR CHOICE
 LINE VOLTAGE REQUIREMENTS: 208-253, 414-506 VAC
 STACK HEAT TRACE CABLE: 120 VAC

SYSTEM:
 PLC WASHDOWN CONTROL PANEL:
 - SKYLEEDER-COLOR TOUCH SCREEN HMI WITH NEMA 1 CSA LABELED CONTROL PANEL C/W TIMER.
 WASH SEQUENCE FEEDBACK (ALARM NOTIFICATION) TO ENSURE VALVES ARE WASHING AT EACH STATION
 ISOLATION DAMPERS: 2 FRP ISOLATION DAMPERS, COME WITH ACTUATORS
 ROOF DUCT: FRP CONSTRUCTION,
 PVC FLEX CONNECTION C/W 316 SS BANDING STRAPS

GENERAL NOTES:
 WINDLOAD RATING: 125 MPH [WITH GUY WIRES ATTACHED]
 GUY WIRES: REQUIRED
 ALL HARDWARE 316SS
 COLOR: PLASTICAIR STANDARD LIGHT GREY
 WEIGHT: 550 LBS STACK / 520 LBS EACH FAN



PROPRIETARY AND CONFIDENTIAL
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UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: 31182-BVS-12 PERCHLORIC
DIMENSIONS ARE IN INCHES	DRAWN	C.B.	8/29/2023	
TOLERANCES: FRACTIONAL $\pm 1/8$ " ANGULAR: MACH \pm BEND \pm TWO PLACE DECIMAL \pm THREE PLACE DECIMAL \pm	CHECKED	Y.I.	8/29/2023	
INTERPRET GEOMETRIC TOLERANCING PER: MATERIAL	ENG APPR.			
NEXT ASSY	USED ON	MFG APPR.		SIZE DWG. NO. REV B 33182-1 1
APPLICATION	DO NOT SCALE DRAWING	COMMENTS:		SCALE: 1:48 SHEET 1 OF 2

4

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2

1

**SECTION 23 34 16
HVAC FANS**

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Centrifugal Roof Ventilators
- B. In-Line Centrifugal Fans
- C. Axial Roof Ventilators
- D. Laboratory Induced Flow High Plume Dilution Blowers
- E. Exhaust Air Plenums
- F. Hydrofluoric Acid Lab Exhaust Fans
- G. Perchloric Acid Lab Exhaust Fans

1.2 RELATED WORK

- A. Drawings, all other Sections of Division 23, and General Provisions of the Contract, including General and Supplementary Conditions, as well as Division 01 Specification Sections, apply to this Section.
- B. All materials, equipment, fabrication, and installation shall meet and comply with all adopted current codes, regulations, standards, etc. as applicable to the product(s) specified in the section, as scheduled on the drawings as well as Division 01 and Division 23 related documents whether called for or not.

1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan performance ratings at 5,800 feet above sea level.
- B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
 - 1. Certified fan performance curves with system operating conditions indicated.
 - 2. Certified fan sound-power ratings.
 - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 4. Material thickness and finishes, including color charts, for options of standard factory color only.
 - 5. Dampers, including housings, linkages, and operators.

- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
 - 2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - 3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For centrifugal fans to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of air handling equipment of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Codes and Standards:
 - 1. Fan Performance Certification: Conform to AMCA standard 211 and 311. Fans must be tested in accordance with ANSI/AMCA Standard 210-99 and AMCA Standard 300-96 in an AMCA accredited laboratory. Fans shall be licensed to bear the AMCA seal for air and sound performance.
 - a. High Plume Dilution fans must also be tested in accordance with AMCA Standard 260 and 300. Fan shall also be licensed to bear the AMCA ratings seal for high plume dilution blowers (AMCA 260). Manufacturers that are not licensed to bear the AMCA 210 and 260 ratings seal, must provide at the owner and engineer's option and manufacturer's expense, witness testing of fan discharge and entrainment airflow, performed in an AMCA accredited laboratory, in accordance with AMCA 210 and 260. This test shall verify the critical and safety related dilution performance of the high plume dilution blower, as stated by the manufacturer.
 - 2. UL Compliance: Provide air handling equipment which are designed, manufactured, and tested in accordance with UL 705 "Power Ventilators". Fans shall bear the UL label for their listing.
 - a. Where utilized in smoke exhaust applications, fans shall be UL listed as "Power Ventilators for Smoke Control Systems" (by maximum temperature for a minimum number of hours of operation) for one of the following.
 - 1) 500 °F maximum temperature for a minimum of 4 hours of operation
 - 3. NEMA Compliance: Provide motors and electrical accessories complying with NEMA standards.
 - 4. Nationally Recognized Testing Laboratory and NEMA Compliance (NRTL): Fans and components shall be NRTL listed and labeled. The term "NRTL" shall be defined in OSHA Regulation 1910.7.
 - 5. Electrical Component Standards: Components and installation shall comply with NFPA 70 "National Electrical Code."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations, with protective crating and covering.
- B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Belts: One set(s) for each belt-driven unit.

PART 2 - PRODUCTS

~~2.1 CENTRIFUGAL ROOF VENTILATORS~~

- A. Manufacturers: The manufacturers listed are subject to compliance of all the requirements within the contract documents; provide the product indicated on Drawings or a comparable product by one of the following:
 - 1. Twin City Fan Company
 - 2. Greenheck
 - 3. Loren Cook Company.
- B. Description: Di using, wheel, fan shaft, bearings, mot nably, curb base, and accessories.
- C. Housing: Remc let baffle; square, one-piece, aluminum base with venturi inlet cone.
- D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades. Non-overloading. Statically and dynamically balanced in accordance to AMCA Standard 204-05.
- E. Direct-Driven Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
 - 1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.

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2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
3. Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
- a. Enclosure Type: Totally enclosed, fan cooled.
- b. Fan and motor isolated from exhaust airstream.
- F. Accessories:
1. Variable-Frequency Drive: Comply with requirements in Division 23 Section "Enclosed Motor Controllers for HVAC."
2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
3. Bird Screens: Removable, 1/2-inch mesh, aluminum.
4. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.
- G. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
1. Configuration: Self-flashing without a cant strip, with mounting flange.
2. Overall Height: 18 inches.
- 2.2 IN-LINE CENTRIFUGAL FANS
- Not part of HEF & PEF specification**
- A. Manufacturers: Manufacturers of all fans shall comply with the requirements of all the product indicated on Drawings or a comparable product by one of the following.
1. Twin City Fan Company
2. Greenheck.
3. Loren Cook Company.
- B. Description: In-line, direct-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.
- C. Housing/Cabinet Construction:
1. Construction material: Galvanized. Square design constructed of heavy gauge galvanized steel.
- D. Fan Wheels: Aluminum, non-overloading, backward inclined centrifugal wheel. Statically and dynamically balanced in accordance to AMCA Standard 204-05.
- E. Direct-Driven Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
3. EC Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
- F. Accessories:
1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 20 percent.

2. ~~Access Panel: Two sided access panels, permit easy access to all internal components. Located perpendicular to the motor mounting panel.~~

2.3 AXIAL ROOF VENTILATORS – (SEF-XXX)

- A. ~~Manufacturers: The manufacturers listed are subject to compliance of all the requirements within the contract documents; provide the product indicated on Drawings or a comparable product by one of the following:~~
1. ~~Twin City Fan Company.~~
 2. ~~Greenheck.~~
 3. ~~Loren Cook Company.~~
- B. ~~Description: Direct-driven axial fans consisting of up-blast housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories. UL 705 Emergency Smoke Control Exhaust~~
- C. ~~Housing: Heavy-gage, coated steel.~~
1. ~~Windband: Constructed of heavy gauge galvanized steel with reinforced and bolted seams. Removable windband to gain access to the fan through the butterfly dampers.~~
 2. ~~Fan Wheel: Cast Aluminum airfoil blade and hub. Statically and dynamically balanced in accordance to AMCA Standard 204-05.~~
- D. ~~Direct-Driven D~~ **Not part of HEF & PEF specification** ~~o housing, with the following feature~~
1. ~~Fan Shaft: Connected to wheel hub.~~
 2. ~~Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.~~
 3. ~~Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."~~
 - a. ~~Enclosure Type: Totally enclosed, air over.~~
- E. ~~Accessories:~~
1. ~~Outlet Guard: Expandable metal.~~
 2. ~~Dampers: Steel backdraft dampers with magnetic damper latches.~~
 3. ~~Butterfly Dampers:~~
 - a. ~~Material: Galvanized Steel~~
 - b. ~~Damper type: Gravity.~~
 - c. ~~Damper Lifter: Fusible link.~~
 4. ~~Access Door: Quick opening inspection doors.~~
 5. ~~Tie-Down Points: Four steel brackets located on windband secures fan in heavy wind applications.~~
- F. ~~Roof Curbs: 14-gauge, galvanized steel; mitered and welded corners; 1-1/2-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.~~
1. ~~Configuration: Self-flashing without a cant strip, with mounting flange.~~
 2. ~~Overall Height: 18 inches.~~

~~2.4 LABORATORY INDUCED FLOW HIGH PLUME DILUTION BLOWERS (EF-601A/B/C/D & EF-602A/B/C/D)~~

- ~~A. Manufacturers: The manufacturers listed are subject to compliance of all the requirements within the contract documents; provide the product indicated on Drawings or a comparable product by one of the following:~~
- ~~1. Greenheck.~~
 - ~~2. Twin City Fans~~
- ~~B. Fans shall be licensed to bear the AMCA ratings seal for air performance (AMCA 210), sound performance (AMCA 300), and induced flow fan for high plume dilution blowers (AMCA 260). Manufacturers that are not licensed to bear the AMCA 210 and 260 ratings seal must provide performance witness testing (at the manufacturer's expense). Manufacturers that do not comply with this requirement must also provide, at the owner and engineer's option and manufacturer's expense, witness testing of fan discharge and entrainment airflow, performed in an AMCA accredited laboratory, in accordance with AMCA 210 and 260. This test shall verify the critical and safety related dilution performance of the high plume dilution blower, as stated by the manufacturer. The fans shall have the AMCA accreditations noted on the submittal documents. Any fans submitted without AMCA accreditations will be rejected.~~
- ~~C. General:~~
- ~~1. Fans shall be belt driven, mixed flow fan wheel in arrangement 9.~~
 - ~~2. Fan wheel bearings shall be selected for minimum average life of L-10 200,000 hours, roller pillow concentric roller bearings, and increase bearing life and improve bearing quality, ball or roller bearings on the fan shaft using a roller bearing and increase bearing life and improve bearing quality.~~
 - ~~3. Fans shall be provided with lift lugs.~~
 - ~~4. Fans shall have motors out of the air stream.~~
 - ~~5. Fans with motors weighing more than 100 lbs and mounted 4' or more in the air shall require an integral hand operated jib arm with hand crank hoist to assist in the removal of the motor.~~
 - ~~6. Lab exhaust fans shall be equipped with a negative pressure seal to ensure that when the fan is running and there are lab contaminants present, the contaminants cannot contaminate the motor and other system components that are out of the exhaust air stream.~~
 - ~~7. Proper installation of the fan per the manufacturers' instructions should result in the exhaust fans being capable of withstanding a minimum 125 MPH wind load without requiring addition supports such as guy-wires. Due to project's minimum wind load of 160 MPH provide additional supports such as guy-wire design, sizing, and details.~~
- ~~D. Fan Housing and Outlet:~~
- ~~1. Fan housing shall be aerodynamically designed with high-efficiency inlet, engineered to reduce incoming air turbulence.~~
 - ~~2. Fan housing shall be bifurcated, allowing all drive components, including the motor, to be serviced without contact of the contaminated airstream. The housing must be manufactured of welded steel and have a corrosion resistant coating. No uncoated metal fan parts will be acceptable.~~
 - ~~3. An air induction discharge nozzle shall be supplied by the fan manufacturer. The nozzle shall be integral to the fan body and shall be~~

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- designed to efficiently handle an outlet velocity of up to 7,000 FPM. The nozzle shall induce ambient air into the exhaust air stream.
4. An integral fan housing drain shall be used to drain rainwater when the fan is de-energized.
 5. An access door shall be supplied for impeller inspection and service.
 6. The entire fan unit (motor, housing, etc) shall fit in the footprint depicted on the contract documents. Fans which have components that do not fit within the footprint may be rejected due to dimension constraints.
 7. Discharge Attenuator: Double wall windband with 2-inch insulation in a S.S. inner liner.
 8. Inline Silencer: A 3-foot center bullet type, 304 stainless steel, perforated interior with coated steel exterior.
- E. Fan Impeller:
1. The fan impeller shall be an inline mixed flow design with non-stall characteristics. The impeller shall be electronically balanced both statically and dynamically exceeding AMCA standards.
 2. The fan impeller shall be manufactured of welded and coated steel.
 3. AMCA Spark B construction.
- F. Corrosion Resistant Coating:
1. All metal fan and system components (fan, nozzle, wind band, plenum) shall be corrosion resistant.
 2. The corrosion resistant coating shall be a standard factory color, if standard factory color is not specified by the Architect.
- G. Fans shall be provided with a bypass damper and one modulating isolation damper. The modulating damper shall be able to have a motorized actuator control it. The motorized actuator is to be provided by the Temperature Controls contractor and shall be capable of being wired into the BAS for control over the actuators and dampers. Each of the bypass dampers shall have end switches mounted on the damper blades to signal to the BAS when they are 100% open and when they are 100% closed. Each of the isolation dampers shall have end switches mounted on the damper blades which signal to the BAS when the damper is 100% closed.
1. Dampers shall be industrial grade dampers and have airfoil type blades. The damper shall be capable of withstanding up to 15 in w.c. The damper blade shall be constructed of 304 stainless steel and have EPDM or silicone blade seals.
 2. The axle shall be made of 3/4" diameter 304 stainless steel and shall be mounted in stainless steel sleeve bearings; and blade to blade linkage which is out of the air stream. The axle shall have a shaft seal.
 3. The frame of the damper shall be 12-gauge steel minimum.
 4. The damper shall have a coating of baked enamel.
 5. Damper manufacturer's printed application and performance data including pressure, velocity and temperature limitations shall be submitted for approval showing damper suitable for the above stated requirements. Testing and ratings shall be in accordance with AMCA Standard 500-D.
 6. All damper access and service (drive actuators) shall be performed outside of the contaminated airstream.
- H. Fans shall be equipped from the factory with an airflow measuring system.

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1. The system shall not intrude in the air flow and shall not cause a pressure drop or any type of resistance to the system.
2. The system shall be capable of taking readings from all fans which are connected together and providing an overall system flow.
3. The flow measuring system shall be capable of connecting to the building automation system (BAS).
4. The air flow measuring system shall be able to provide individual lab exhaust fan air flow and the total system flow.
5. The system shall be accurate to 1% of full scale.

2.5 EXHAUST AIR PLENUM (EAP-601 & 602)

- A. Manufacturers: The manufacturers listed are subject to compliance of all the requirements within the contract documents; provide the product indicated on Drawings or a comparable product by one of the following:
1. Temtrol (A Nortek Company)
 2. Huntair (A Nortek Company)
 3. ClimateCraft.
 4. Haakon.
- B. Provide an exhaust air plenum associated with the laboratory exhaust fans on the roof of the building as shown on the drawings. EAP shall be provided by supplier of the lab exhaust fans (EF-601A-601D & EF-602A-602D).
1. The plenum shall have an incorporated blank off panel for each of the four fans connected to the plenum. The blank off panel shall be located off the exhaust air from the fan to prevent the exhaust air from entering the plenum. The blank off panel shall have a damper for service access. The blank off panel shall be located off the exhaust air stream to the personnel servicing the damper.
 2. All interior surfaces of the casing shall be type 316 stainless steel and shall be sealed water tight. The floor shall be 316 stainless steel and sealed water tight. This will saturate the exhaust air causing the inside of the EAP to be wet. Provide drain pans to drain any excess moisture of the future install of the exhaust pre-cooler (IEVC-601 & 602).
- C. General: Provide factory-fabricated and factory-tested air handling units as indicated, of sizes and capacities as scheduled, and as specified herein. Units shall have overall dimensions as indicated and fit into the space available with adequate clearance for service as determined by the Engineer.
1. All units shall be factory wired, assembled and airflow tested.
 2. All hardware material shall match materials being fastened (i.e., stainless-steel hardware for stainless steel, galvanized steel hardware for galvanized steel, etc.).
 3. Provide unit consisting of indirect atomizing evaporative cooling section, energy recovery coil sections, control dampers, drain pans, heated piping service vestibule as specified, scheduled, and shown on the drawings.
 4. Unit shall be completely factory assembled and tested prior to shipment and shall be listed per UL 1995, as a complete assembly and shall be labeled as such.
 5. Multiple sectioned units shall be shipped as a single factory assembled piece (except where shipping limitations prevent and de-mounted into modular sections in the field by the contractor). Tags and decals to aid in

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specification**

~~service or indicate caution areas shall be provided. Electrical wiring diagrams shall be attached to the control panel access doors.~~

a. Rigging Provision – Multiple Piece Units: Units shipped in multiple sections shall be engineered for field assembly. The base frame shall have integral lifting lugs. The lifting lugs shall be fabricated from structural steel with an appropriate rigging hole. Lifting lugs shall be located at the corner of each section (and along the sides if required) and sized to allow rigging and handling of the unit. All gasket and necessary assembly hardware shall ship loose with unit. Junction boxes with a factory supplied numbered terminal strip shall be supplied at each shipping split for reconnection of control wiring.

D. Cabinet: Walls and roof shall be 2-inch double wall construction. Exterior cabinet with minimum 16-gauge A90 galvanized steel for the outer skin and a minimum 20-gauge 304 stainless steel for the inner, solid liner. Panels shall be standing seam construction with seams turned inward to provide smooth flush exterior. Panels shall be bolted together on maximum 8-inch centers with minimum 5/16" zinc plated bolts and sealed with a continuous bead of silicone caulking applied between the matching panel seams prior to assembly and with a final bead following assembly on both the exterior and interior panel seams to produce an airtight unit. Weatherproof units shall be constructed with raised seams. Raised Roof Seams to be sealed between sandwiched panels with a bead of silicone caulking. The top of each roof panel seam is to receive a final bead of caulking and be sealed with a 16-gauge roof cleat mechanically formed to enclose the standing seam at roof to sides a minimum 1-inch all around u

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down over the side panels. All doors and louvers shall have a formed rain shield extending a minimum of 1-inch from the wall to direct water away from the door and louver openings. Unit shall be designed to withstand specific operating pressures, at the discretion of the Owner/Engineer, the unit shall be tested for leakage and shall pass a pressure test of 1.5 times the design maximum fan operating static pressure and 0.5% design airflow leakage rate. Testing shall be conducted at the factory. If tested, the test report shall be included with the final O&M.

1. All joints shall be sealed airtight, to prevent leakage.
2. Wall to base skin and wall to roof panel seams shall be sealed with rubber strips and all exterior seams shall be continuously caulked to ensure leak-proof integrity of the unit housing.
3. AHU housing shall be constructed to prevent conditioned air bypass or mitigation through unit walls, roof and floor around any interior partition or component blank off walls such as filters, coils, or fan bulkheads.
4. Insulation: Panels shall be insulated with a minimum of 2-inch-thick fiberglass insulation. The insulation shall be pre-molded. Insulation shall comply with NFPA 90A, NFPA 90B and ASTM E 84 for flame spread of 25 or less and smoke development of 50 or less. Insulation shall have a thermal conductivity of 0.26 (BTU-in./sq.ft.-°F) at 75 °F mean temperature.
5. All cut edges of the insulation shall be completely enclosed by the unit panels. A finish bead of caulking shall be applied over all foil to panel

- ~~seams and/or inner liners to main panel seams to completely encapsulate the insulation.~~
6. Stiffeners of angle steel shall be supplied as required to maintain a casing deflection criteria of L/200 at 1.5 times the working pressure.
 7. Access doors shall be 2-inch double wall construction with 304 stainless steel interior panels and G90 galvanized exterior panels. The door jamb and frame shall be constructed of extruded aluminum with continuously welded corners for rigidity. Door panels shall be insulated with 2-inch-thick fiberglass insulation completely encapsulated and sealed between the door panels and frame. Provide doors located and sized to allow for routine maintenance including motor replacement and filter replacement, electrical components and any other sections or components requiring access or maintenance.
 8. Doors shall be provided with a minimum of two dual heavy duty key locking composite latches up to 48-inches high. Latches shall be operable from both the interior and exterior of the unit. Door latches on doors into fan sections shall be provided with hasp or other mechanism to facilitate locking of the doors. Door hinge shall be heavy duty stainless steel. The door shall be sealed with continuous hollow closed cell foam gaskets. Full perimeter door seals/gaskets shall be replaceable.
 9. Doors shall open against static pressure unless obstructed by internal components. If obstructed by internal components on the positive sections requiring access, doors shall be provided with a safety interlocking mechanism permanently fixed, caution sign on the exterior of the door. Doors with access to moving parts must also have locking hardware and meet current UL mechanical protection guidelines. Standard door size shall be 24-inches wide by 60-inches high unless restricted by height or section width.
 10. Doors shall be provided with double thermal pane wire glass viewing windows as shown on the drawings. The minimum window size shall be 9"x9" with 12"x12" provided door sizing permitting.
 11. Provide reinforced points of support for installation of each section.
 12. All walls, roof, base/bottom shall be coated with a dry powder baked polyester coating. Coating shall not be completed on components until all cutting/punching/etc. is completed so that all metal surfaces (including edges) are coated. Coating shall be completed before assembly starts to ensure all surfaces are coated. Spray/brush applied coatings on the exterior of the cabinet are not acceptable. The coating shall pass salt spray resistance test (ASTM B 117-90 minimum 1,000 hours). Standard factory colors are acceptable, if standard factory color options are available, color shall be selected by the Architect.
- E. Base: Unit bases shall be constructed from structural steel channel iron or tubing around the entire perimeter of the unit and provided with intermediate structural tubing, channel and angle iron as required to support all internal components. All tubing, channel and angle joints shall be solid welded. Bolted or formed channel bases are not acceptable.

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specification**

1. ~~The base shall be provided with removable lifting lugs minimum (4) per section, properly located to assure uniform loading. Maximum spacing between lifting lugs shall be 120-inches.~~
 2. ~~The base structure shall be extended at each end and at locations along the edge as determined by the AHU manufacturer to allow the AHU to be supported (hung) from the frame without the use of additional structure or trapeze (refer to detail). Coordinate the support of the unit with the GC, building structure and access openings into the AHU. None of the supports shall block access to the AHU.~~
- F. Drain Pans: Shall be 304 stainless steel double-walled construction with solid welded seams for complete water capture and containment. Pans under cooling coils shall extend a minimum 12-inches passed the leaving face of the coil in direction of airflow. Drain Pans shall be fully recessed in the unit floor and all headers and return bends shall be located over the drain pan for collection of all condensate forming on headers and return bends. All coils shall be easily removable without cutting or removing any portion of the drain pan. Pans shall be insulated between the liner and the main pan. Pans shall be IAQ Double Sloping to a single drain. Drain connection shall be a minimum 1-1/4-inch diameter MIPS thread extending out through the channel base the same side as the coil connections unless otherwise indicated on the drawings. Pans shall be provided for cooling coils, humidifiers, and under other components as required. Mastic coated drain pans are not acceptable as they are "non-cleanable."
- G. Energy Recovery C
1. Refer to Spec **Not part of HEF & PEF specification** installed coils from capacity. Coordinate the final size coil with the energy recovery coil manufacturer. The coil shall be mounted in unit in manner permitting individual coil removal through the access door. The AHU manufacturer shall provide the internal AHU dimensions to the energy recovery manufacturer during the submittal phase. Prior to receiving the coils from the energy recovery system manufacturer, the AHU manufacturer shall receive a set of prints detailing the coils. The AHU manufacturer shall sign off on the coil sizes, layouts, and installation requirements. It is the AHU manufacturer and energy recovery system manufacturer's responsibility to coordinate coil installation. The Owner will not accept change orders from failed coordination.
 2. Coil Sections: Provide individual casing for coils as required. Design internal structure of coil section to allow for removal of coils, and provide suitable baffles to assure no air bypass around coils. Casing shall be minimum 16-gauge 316 stainless steel with 1-inch flanges on all sides of the coil with the tube sheets having pressed or extruded tube holes. The coil casing shall be reinforced so that maximum unsupported length is 60-inches. The reinforcements shall be of the same material as the casing. Both ends of the coil shall be sealed off from the main air stream by full height blank off panels on both the entering and leaving air sides. Blank off panels shall be of the same material as the coil casing.
 3. Coil Piping: Supply and return piping connections shall extend through the cabinet wall and shall be sealed with rubber grommets with caulking on the exterior of the casing. The escutcheon plate shall have a rolled collar around the pipe opening to provide the pipe and be equipped with an o-

ring between the collar and the pipe to prevent chaffing and provide an air tight seal around the opening.

H. Indirect Atomizing Evaporative Cooler:

1. Refer to Specification Section 237616. Provide factory installed fog nozzles and grid from indirect evaporative air cooler manufacturer of scheduled capacity. Coordinate the final size grid and installation requirements for the grid and nozzles with the indirect evaporative air cooler manufacturer. The AHU manufacturer shall provide the internal AHU dimensions to the indirect evaporative air cooler manufacturer during the submittal phase. Prior to receiving the grid and nozzles from the indirect evaporative air cooler manufacturer, the AHU manufacturer shall receive a set of prints detailing the coils. The AHU manufacturer shall sign off on the grid and nozzle sizes, layouts, and installation requirements. It is the AHU manufacturer and indirect evaporative air cooler manufacturer's responsibility to coordinate installation. The Owner will not accept change orders from failed coordination.

I. Airflow Measuring Systems:

1. Provide airflow measuring station and associated transducer, in outside air intake. Unit shall be factory mounted. Temperature controls contractor shall connect the monitor to the BAS and adjust settings as required for the project conditions. Provide unit mounted in each EAP air tunnel for airflow measuring system of the exhaust airflow over each energy recovery coil. The system shall measure the flow of the exhaust air. Each system shall include a sensing element array suitable for microprocessor signal processor. System components shall be selected to ensure overall accuracy and performance. Final location shall be determined by the airflow sensor provider coordinating with the AHU manufacturer. The location shall measure exhaust air flow in each air tunnel and shall not be affected by any dampers. Sensing element material: 316 Stainless Steel. The sensing elements shall be manifolded together in a 316 Stainless Steel casing section with 90° undrilled flanges, fabricated to exhaust air plenum air tunnel size (coordinate with AHU manufacturer).
 - a. The sensing element(s) shall be designed and built to comply with and provide results according to accepted practice for duct system traversing defined in ASHRAE Fundamentals Handbook, AMCA publication #203. The number of sensing ports on each element, and quantity of elements utilized at each installation shall comply with ASHRAE 111.
 - b. Dual integral chambered design containing multiple total and static pressure sensing ports along leading edge of cylinder. Static pressure chamber shall incorporate dual offset static taps on opposing sides of averaging chamber to permit flow angle variations up to ±20° in approaching airstream without affecting output value.
 - c. The system shall be capable of producing steady, non-pulsating signals of true total and static pressure, with accuracy of ± 2% of actual flow for operating velocities as low as 100 FPM. Signal amplifying sensors requiring flow corrections (k factors) for field calibration are prohibited.

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- d. ~~The system shall not induce a static pressure drop greater than 0.18-inch w.c. at 4,000 FPM.~~
- e. ~~Airflow/Pressure Transmitters: Each transmitter shall be designed to measure, sum, and report the flow rate of up to three systems with up to ten flow sensing points and measure up to four additional independent differential pressure sensing points with an accuracy of $\pm 0.50\%$ of full scale. The transmitter shall be housed in a hinged compact NEMA4X enclosure to provide flexibility in mounting location. Transmitter shall include a color touchscreen with on-screen keypad and setup wizard allowing for simple field configuration when required. Connection to the airflow sensor shall be by plenum tubing. The total (summed) airflow rate for each system shall be available to the Building Management System (BMS) or local controller via dedicated field selectable 0 to 10 VDC or 4 to 20 mA analog outputs and via field selectable BACnet- MS/TP network communications. Independent flow and pressure values for each of the ten sensing points shall also be available to the BMS or local controller via network communication.~~
- f. ~~Basis of Design – Paragon Controls Incorporated – FE-1500 with MTSE.~~
- J. ~~Dampers: Furnish and install, at locations shown on plans, or in accordance with schedules, Standard low leak dampers with published leakage data certified under the AMCA certified ratings program. Low leak dampers shall be rated less than 10 cfm per sq. 48-inch x 48-inch diameter.~~
1. ~~Control damper casing provide steel blades and stainless-steel edge seals. Blades shall be double skin airfoil type 304 stainless steel (maximum 8-inch depth). Blade edge seals shall be extruded vinyl double edge design with inflatable pocket that enables air pressure from either direction to assist in blade to blade seal. Blades shall be mechanically locked in extruded blade slots, yet be easily replaceable in the field. Adhesive or clip-on type blade seals are not acceptable. Bearings shall be non-corrosive molded synthetic. Axles shall be square or hexagonal (round is not acceptable) to provide positive locking connection to blades and linkage. Linkage shall be concealed in the frame.~~
2. ~~Damper Operators: Electric specified in Division 23 Section "Instrumentation and Control for HVAC."~~
- a. ~~All damper access and service (drive actuators) shall be performed outside of the contaminated airstream.~~
- K. ~~Electrical Connections:~~
1. ~~All electrical and automatic control devices not previously called out or listed below are to be furnished and installed in the field by OTHERS.~~
2. ~~The unit shall feature a mounted permanent nameplate displaying at a minimum the manufacturer, serial number, model number and current and amps voltage. The unit must have an ETL or UL Listing and bear the appropriate mark.~~
3. ~~Conduit shall consist of a combination of EMT or flexible metal conduit as required. Liquidtite flexible metal conduit may be used outside the air tunnel for wet locations.~~

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4. ~~All wiring shall be (75°C) Insulated copper wires.~~
5. ~~Manufacturer shall allow a minimum 1.5" clearance above the entire width of each interior bulk head to allow for 120 V or 24 V internal field wiring for the controls contractor.~~
6. ~~If the unit requires shipping splits, junction boxes shall be furnished at each section to allow the electrical contractor to make field connections. Wiring shall be clearly labeled at the junction points to facilitate reconnection.~~
7. ~~Airflow Measuring Systems:
 - a. ~~The factory installed/wired airflow system monitoring panel shall be provided with a 120V circuit, coordinate auxiliary 120 V electrical loads with the electrical contractor.~~~~
8. ~~Lighting:
 - a. ~~Provide 15 W LED marine type fixtures in each accessible section complete with a protective metal cage and sealed glass enclosures. Lights shall be wired to a common switch mounted adjacent to the fan access door. Power for the lights shall be 120 V from a separate circuit, coordinate power for lighting with project electrical contractor. All wiring to lights shall be in conduit and internal to the unit. No ex~~~~
9. ~~Convenience Outl
 - a. ~~Furnish a 1: exterior of the unit as indic convenience outlet shall be 120 V from a separate circuit, coordinate power for outlet with project electrical contractor.~~~~
10. ~~Access Vestibule Unit Heater(s):
 - a. ~~Electric Unit Heater provided by AHU manufacturer, field installed by MC and field wired by EC.~~
 - b. ~~Provide 4kW, 480V/3P, Indeco UCI Series, or equivalent, electric unit heater with unit mounted thermostat for upper air tunnel service vestibule. AHU will need to coordinate unit supports and location for all required access clearances.~~
 - c. ~~Provide 3kW, 480V/3P, Indeco UCI Series, or equivalent, electric unit heater with unit mounted thermostat for lower air tunnel service vestibule. AHU will need to coordinate unit supports and location for all required access clearances.~~~~
11. ~~Temperature Control Panels:
 - a. ~~Power/wiring shall not be provided by the AHU manufacturer.~~
 - b. ~~The electrical contractor will provide a separate 120-V stand-by power circuit for temperature controls.~~~~
- L. ~~Roof Curb: Curb shall include (2) layers 1 1/2" - 3lb. rigid insulation. Refer to plans for additional information.~~

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specification**

2.6 HYDROFLUORIC ACID LAB EXHAUST FANS (HEF-XXX)

- A. Manufacturers: The manufacturers listed are subject to compliance of all the requirements within the contract documents; provide the product indicated on Drawings or a comparable product by one of the following:
 1. Plasticair (Skyplume)
 2. MK Plastics

- B. Special Chemical Resistant Requirements for shall be able to withstand the minimum 52% hydrofluoric acid solution without degradation to any part of the fan assembly or housing.
- C. Fans shall be licensed to bear the AMCA ratings seal for air performance (AMCA 210), sound performance (AMCA 300), and induced flow fan for high plume dilution blowers (AMCA 260). Manufacturers that are not licensed to bear the AMCA 210 and 260 ratings seal must provide performance witness testing (at the manufacturer's expense).
- D. General:
 - 1. Classification for Spark Resistant Construction Conform to AMCA 99.
 - 2. Fans selected shall be capable of accommodating static pressure or flow variations of +/-15% of scheduled values.
 - 3. Each fan shall be belt driven in AMCA arrangement 1, 9 or 10 according to drawings. Fans submitted that are not in arrangement 10 with the motor accessible at roof level, shall have a jib crane (complete with removable hoist), provided by the fan manufacturer, to perform motor maintenance and replacement.
 - 4. Fans to be equipped with lifting lugs.
 - 5. Fan stand to be coated steel with a minimum of 4-6 mils of Plastifer baked Polyester powder coating.
 - 6. Fasteners to be 316 stainless steel.
 - 7. UV inhibitors are added to the resins and are flame retardant class 1 of 25 or less.
 - 8. ALL AIRSTREAM FRP COMPONENTS TO HAVE A SYNTHETIC VEIL LINER FOR HF USE.
 - 9. Fan shall extend to height noted in drawing details. Discharge from fan (not from wind band) shall be a minimum of 10' above the finished roof level. Provide fan extensions as required to comply with this requirement (based on wind study results). Guy wires are not acceptable. Any stack extensions shall be fabricated from materials compatible with hydrofluoric acid as noted in other sections of this specification. Fans shall be able to withstand winds of 160 MPH without the use of guywires.
 - 10. Provide FRP, OSHA compliant belt guards for all belts. Guards shall be vented where required for proper ventilation.
- E. Fan Housing:
 - 1. Fan housing to be aerodynamically bifurcated designed with high efficiency inlet, engineered to reduce incoming air turbulence. Casings to be smooth exterior and resin rich interior.
 - 2. Fan housing shall be manufactured in specifically formulated resins, for maximum corrosion resistance, UV inhibited and reinforced with fiberglass for structural strength. Fastening bolts holding the casing to the support plate are to be encapsulated in FRP. No uncoated metal fan parts in the corrosive air stream will be tolerated.
 - 3. Fastening bolts holding the casing to the support plate are to be encapsulated in FRP. No uncoated metal fan parts in the corrosive air stream will be tolerated. Fans shall be supplied with an internal graphite liner and grounding strap to remove static electricity.
 - 4. A casing drain with plug attached to the casing at the lowest point for condensation removal as specified.

5. All fiberglass parts shall include UV inhibitors in the resins to prevent chalking from the sunlight. Fans shall comply with ASTM E84 Flame/smoke spread index of 25 or less.
 6. Standard finish color to be light gray.
 7. Hub seal to be neoprene or Teflon.
 8. A graphite liner and grounding strap shall be included to remove any possible buildup of static electricity.
- F. Fan Impeller:
1. Impellers shall be solid molded FRP With backwardly curved blades or shall be backwardly inclined airfoil. FRP hub to have a tight fitting cap to protect shaft end. The hub to extend outside the casing. Impellers manufactured in steel and coated with a plastic material are not acceptable. The impeller shall be electronically balanced both statically and dynamically Grade G2.5 per AMCA 204 Standard.
- G. Fan Motor:
1. Motors shall comply with section 230513.
 2. Motors shall be premium efficiency, 1800 RPM, TEFC with a 1.15 service factor. A factory mounted NEMA 3R or 4X disconnect switch shall be provided for each fan. Motor maintenance shall be accomplished without fan impeller removal or requiring access to the contaminated exhaust components.
 3. Drive belts and sheaves shall be sized for 150% of the fan operating brake horsepower and shall be readily and easily accessible for service.
 4. Fan shaft shall be 316 stainless steel.
 5. Bearings shall be spherical roller or adapter mounted anti-friction ball, self-aligning, pillow block type and selected for a minimum average bearing life of greater than 200,000 hours at the maximum RPM (L10-200,000 bearing rating). All non-permanently lubricated bearings shall have grease lines extended with zerk fittings.
- H. Fan Inlet Plenum:
1. An inlet plenum shall be provided as shown on drawings. The plenum shall be equipped with a bypass air damper and weather cowl and bird screen for introducing outside air at roof level upstream of the fan. The plenum shall be constructed of double wall, thermally and acoustically insulated 1" thick fiberglass panels, bonded, reinforced and sealed together to prevent noise and air leakage.
 2. The plenum shall be mounted on a roof curb as shown on the project drawings. Inlet plenum to be attached to the fan inlet by a flexible FPVC connector, provided by the fan manufacturer. The manufacturer shall provide a raised platform as required to gain the height noted on the drawings. Refer to the specifications. The platform shall be designed to support the weight of the fans and any external forces (such as wind).
 3. Bypass air damper shall be opposed-blade design, and the damper and inlet louver for each inlet plenum shall be fabricated of anodized aluminum.
 4. A fan isolation damper fabricated of FRP and be parallel blade design.
 5. Plenum shall be designed for a dual fan configuration with 100% redundant fan.
 6. Bypass damper shall be opposed-blade, airfoil design, constructed of FRP with linkage hardware installed in the side frame. Damper shaft shall be

- 1/2" square shaped, FRP. The bypass damper shall have a manual locking quadrant to be set during the air balance for a fixed amount of bypass air.
7. Fan isolation dampers shall be parallel-blade, airfoil design, construed of FRP with linage hardware installed in the side frame. Damper shaft shall be 1/2-inch square shaped FRP.
 8. All dampers shall have an extended control shaft for electronic actuation.

2.7 PERCHLORIC ACID LAB EXHAUST FANS (PEF-XXX)

- A. Manufacturers: The manufacturers listed are subject to compliance of all the requirements within the contract documents; provide the product indicated on Drawings or a comparable product by one of the following:
 1. Plasticair (Skyplume)
 2. MK Plastics
- B. General
 1. All fans shall be rated in accordance with AMCA 211 and 311 certification standards.
 2. Project-specific performance and construction requirements shall be as scheduled and supplied on project submittal drawings or as otherwise indicated in project submittal documents.
 3. Bypass dampers, if provided with fan system, shall comply with Section 23 09 13 – Control Dampers. Not applicable to integral face and bypass dampers.
 4. Fans and stacks shall be designed and constructed so that the gas stream only contacts solid FRP surfaces.
 5. All FRP will be 0-25 Flame spread as per ASTM-E84.
 6. The complete system shall be designed to a wind load rating of 160 MPH, provide guy wires if required to meet design wind load rating.
 7. All steel fasteners shall be 316 stainless steel.
 8. Motor shafts will be fully protected from exposure to the gas stream by FRP shaft sleeves.
 9. The fan shall be constructed spark resistant per AMCA Standards 99.
 10. The fan arrangement will be based on AMCA 99 and will be Direct Drive AMCA arrangement 4, 9, & 10
- C. Air Performance
 1. The performance ratings are to be in accordance with project plans and specifications. No other performance standard or test will be accepted.
 2. Sound levels, horse power levels are not to exceed scheduled values.
 3. Plume heights are to be calculated using the wind band volume by using the ASHRAE Briggs effective plume height calculation and are not to be less than scheduled values.
- D. Venturi Stack
 1. The By-pass Venturi Exhaust System is to be designed and constructed so that Perchloric acid can be exhausted safely and in accordance with all local and federal building codes regarding Perchloric acid ducting systems.
 2. The only acceptable material of construction exposed to the Perchloric acid gas stream will be FRP with premium Derakane 510C Resin System.
 3. Construction shall be smooth and without crevices.

4. Construction for entire assembly located outdoors to be FRP Double wall, insulated with internal pipe heat tracing cables complete with NEMA 1-15 connection.
 5. Construction for the entire assembly indoors is to be single wall construction and materials as shown on plans.
- E. Housing Construction
1. The fan housing is to be solid Fiberglass with resin impregnation throughout.
 2. The outlet and inlet flanges are to be of heavy industrial quality.
 3. All flanges are to have factory flat finishes.
 4. The materials of construction will be premium quality vinyl ester resin and reinforcing glass throughout.
 5. The entire surface exposed to the gas stream will be complete with a resin-rich corrosion barrier consisting of C-veil and a smooth finish.
 6. The outer surface of the housing will be of a heavy UV stabilized gel coat.
 7. The housing shall include a machined Teflon shaft seal to limit gas leakage.
- F. Venturi Duct
1. The material of fabrication for the venturi duct is to be FRP
 2. PVC spray header are situated to guarantee a wet inner surface throughout the by-pass system.
 3. A rigid 90-degree FRP duct extension is fabricated into the inner duct just below the venturi section to accept the inducing draft from the blower
- G. Blower
1. The industrial blower is to be constructed of solid FRP.
 2. The impeller shall not be pigmented in order to detect imperfections.
 3. Fan stand to be constructed of welded and formed steel and coated with 4-5 mils of epoxy.
 4. Fan shall be arrangement #9/10 or #4 (per schedule) c/w belts, guards, vibration isolators, TEFC motor.
 5. Outlet manual locking quadrant control damper.
 6. Fan inlet shall be fitted with a 304 stainless steel bird screen.
 7. The fan shall bear the AMCA Air Performance Seal.
- H. Impeller Design and Construction
1. The impeller is to be of a high efficiency backward curved design.
 2. The materials of construction will be premium quality vinyl ester resin and reinforcing glass throughout.
 3. The method of construction is to be fiberglass hand lay-up only.
 4. The entire surface of the impeller exposed to the gas stream will be complete with a resin-rich corrosion barrier consisting of C-veil and a smooth finish.
 5. The shaft is to be attached to the back -plate of the impeller by way of a taper lock bushing and a one-piece cast sprocket hub.
 6. The entire shaft attachment assembly is to be completely covered with a minimum 0.25" of FRP lay-up for further corrosion protection.
- I. Bearings
1. Bearings are to be ball bearing or spherical roller type located inside the motor.

2. The bearings are to be rated and designed for a minimum L-10 life of 200,000 hours.
 3. The bearings are to be located out of the air stream.
 4. The method of lubrication will be grease per the motor manufacturer's recommendations.
- J. Drive Arrangements
1. Available for Belt & Direct Drive Arrangements.
 - a. V-belt drive shall be sized with a safety factor of 1.5 times the motor horsepower.
 - b. An Adjustable base will be provided under the motor to permit setting the belt tensions.
- K. Guards
1. Weatherproof FRP guards complying with the OSHA standard will protect the shaft and V-belt drive.
 2. Guards will be vented for proper motor ventilation.
- L. Motor
1. Premium/High Efficiency Motor shall be Foot mounted, TEFC, NEMA Standard 3-Phase Motors 60Hz, 460V with a 1.15 service factor.
 2. The motor shall be Inverter Duty with Class F Insulation for up to 40 Deg. C Ambient Temperature for Continuous Duty.
- M. Shaft
1. Fan Shaft will be 1045 carbon Steel complete with the correct keyways to accept V-Belt Drive Selections
 2. The Diameter of the shaft shall be sized to ensure that the critical speed of the fan is at least 25% above the fan operating speed.
 3. Motor shaft will be 1045 carbon steel complete with the correct keyways to accept direct wheel/impeller mount selections.
 4. The impeller side of the shaft shall be complete with an FRP shaft sleeve, which is bonded to the back-plate of the impeller and protrudes through the housing.
 5. The shaft outside diameter shall mate with minimum clearance to a Teflon shaft seal for no metallic contact with airstream.
- N. Steel Fan Base
1. The fan base is to be of a heavy-duty industrial quality design to minimize vibration and to ensure long life. The bearing shaft pedestal is to be constructed of heavy gauge steel.
 2. The fabrication method is to be all welded.
 3. After welding is complete, prior to the fan assembly, the fan base is to be sandblasted white and clad with FRP to a total of 3/16" thickness.
 4. The base is to be rust proof. Painted bases are not acceptable.
- O. Flushing and Wash rings
1. For FRP duct PVC spray nozzles shall be fabricated directly into the duct system.
 2. For 316 stainless steel duct, 316 stainless steel nozzles will be fabricated directly into the system.
 3. Nozzles will be implemented as shown on drawings.
- P. Wash System with Control Panel

1. A control panel is to be supplied by the fan manufacturer. Wash sequencing is to be controlled so that flooding does not occur.
2. Control panel shall provide touch screen operator interface with color display including passcode.
3. On screen wash instructions shall indicate events and sequence status.
4. Control panel will be PLC based and supplied in a NEMA 4X enclosure CSA/ESA Field certification of the assembly.
5. The fan manufacturer is to provide a quantity of solenoids as described in the contract documents for field connection to the flushing and wash-rings.
6. Solenoid vales shall be factory mounted with a multi-station manifold located below the controller and include wiring of the solenoid valves to the controller.
7. Solenoid valves shall be model number ASCO 8210, or Burkert Model 5281 Series and include normally open and normally closed valves to complete the wash-down sequence.
8. Solenoid valves shall be field piped by installing contractor and provided with 1/2-inch FPT threaded outlets for connection to respective wash-down stations. Pipe and pipe fittings shall be supplied by installing contractor.
9. Controller shall provide control of the Perchloric fume hood duct wash-down cycle and provide necessary interlocks with timing sequence of the wash-down program.
10. The controller shall contain a microprocessor and provide the following functions:
 - a. Passcode with on screen input and login
 - b. Duct wash-down cycle with pause mode allowing the cycle to maintain in original sequence
 - c. Notification for wash cycle required – programmable on screen with calendar setup
 - d. Water wash volume totalizer
 - e. Wash sequence feedback (alarm notification) to ensure valves are operating and washing at each station
 - f. Start-up and Commissioning – Valve Sequence Screen
 - g. Start and stop of venturi fan command
 - h. Wash water inlet pressure switch (alarm notification)
11. Control panel will be supplied loose for contractor field wiring. All local electrical codes must be adhered to.
12. Controller shall be 120V, 1 phase, 5 amps rated and shall be UL/CSA labeled.

Q. Balancing And Testing

1. All fans shall be completely assembled and test run as a unit at the specified operating speed prior to shipment.
2. Balancing of the impeller shall be achieved only with the use of the identical material used to fabricate the impeller.
3. Balancing shall be in accordance with ASTM D-4167.
4. The fan shall be test run at operating speed and not shipped until vibration readings are within acceptable limits. Acceptable limits are as per G2.5.
5. Records shall be maintained and a written copy shall be available upon request

2.8 SOURCE QUALITY CONTROL

- A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, housekeeping pads, and other conditions affecting performance of fans.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install centrifugal fans level and plumb.
- B. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 07 Section "Roof Accessories" for installation of roof curbs and Vibration-control devices are specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."
- C. Support suspended units from structure using threaded steel rods with Vibration-control devices are specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."
- D. Install units with clearances for service and maintenance.
- E. Label fans according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.3 EXHAUST AIR PLENUM INSTALLATION (EAP)

- A. General: Install air handling units where indicated, in accordance with equipment manufacturer's published installation instructions, and with recognized industry practices, to ensure that units comply with requirements and serve intended purposes.
- B. Coordination: Coordinate with other work, including ductwork, floor construction, roof decking, and piping, as necessary to interface installation of EAP with other work.
- C. Access: Provide access space around the EAP for service as indicated, but in no case less than that recommended by the manufacturer.

- D. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
 - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
- E. Piping Connections: Refer to Division-23 HVAC sections. Provide piping, valves, accessories, gauges, supports, and as indicated.
 - 1. Provide flexible connectors shutoff valves, balancing valves, unions, thermometers (supply and return), P & T types (supply & return) and other accessories on all piping connections.
- F. Duct Connections: Refer to Division-23 Air Distribution sections. Provide ductwork, accessories as indicated.

3.4 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."
- B. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
 - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Electrical sections. Ensure that rotation is in direction indicated and intended for proper performance. Do not proceed with centrifugal fan start-up until wiring installation is acceptable to centrifugal fan Installer.
 - 2. Temperature control wiring and interlock wiring are specified in Division 23.
 - 3. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
 - 4. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- C. Install ducts adjacent to fans to allow service and maintenance.
- D. Install line-sized piping from scroll drain connection, with trap with seal equal to 1.5 times specified static pressure, to nearest floor drain.

3.5 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Verify that cleaning and adjusting are complete.

4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 5. Adjust belt tension.
 6. Adjust damper linkages for proper damper operation.
 7. Verify lubrication for bearings and other moving parts.
 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 9. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
 10. Remove and replace malfunctioning units and retest as specified above.
- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 SPARE PARTS

- A. General: Furnish to Owner with receipt one spare set of belts for each belt driven air handling equipment.

3.7 COMMISSIONING

- A. Final Checks Before Start-Up: Perform the following operations and checks before start-up:
1. Remove shipping blocking and bracing.
 2. Verify unit is secure on mountings and supporting devices and that connections for piping, ductwork, and electrical are complete. Verify proper thermal overload protection is installed in motors, starters, and disconnects.
 3. Perform cleaning and adjusting specified in this Section.
 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearings operations. Reconnect fan drive system, align belts, and install belt guards.
 5. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.
 6. Verify manual and automatic volume control and that fire and smoke dampers in connected ductwork systems are in the full-open position.
 7. Disable automatic temperature control operators.
- B. Starting procedures for fans:
1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM.
 2. Replace fan and motor pulleys as required to achieve design conditions.
 3. Measure and record motor electrical values for voltage and amperage.
- C. Shut unit down and reconnect automatic temperature control operators.
- D. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for procedures for air-handling-system testing, adjusting, and balancing.

3.8 DEMONSTRATION

- A. Demonstration Services: Arrange and pay for a factory-authorized service representative to train Owner's maintenance personnel on the following:
 - 1. Procedures and schedules related to start-up and shutdown, troubleshooting, servicing, preventative maintenance, and how to obtain replacement parts.
 - 2. Familiarization with contents of Operating and Maintenance Manuals specified in Division 01 Section "Project Closeout" and Division 23 Section "Basic Mechanical Requirements."
- B. Schedule training with at least 7 days' advance notice.

END OF SECTION